January, 1958 THREE SHILLINGS

# Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

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Moulding Powders
Sheets for Vacuum Forming
Monofilaments

## CASEIN

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## P·V·C

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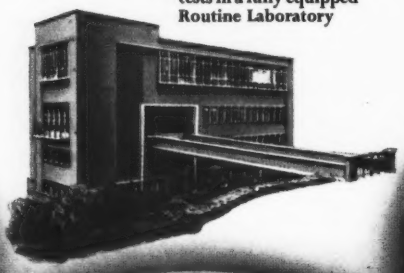
**All materials passing through the Erinoid factory are subject to rigid control and tests in a fully equipped Routine Laboratory**



## CELLULOSE ACETATE

Moulding Powders and Sheets

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Sections in all materials to customer's specifications

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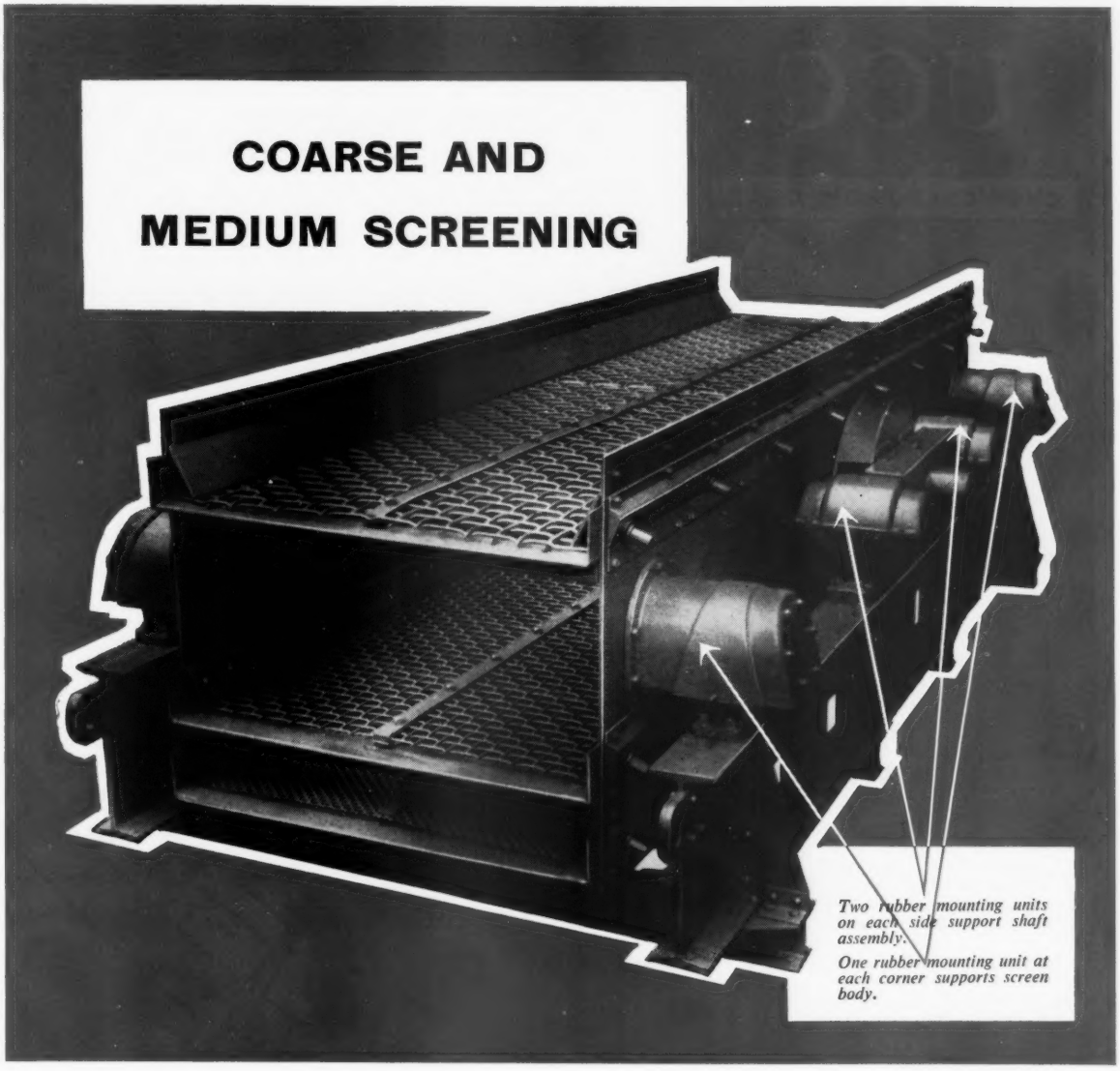
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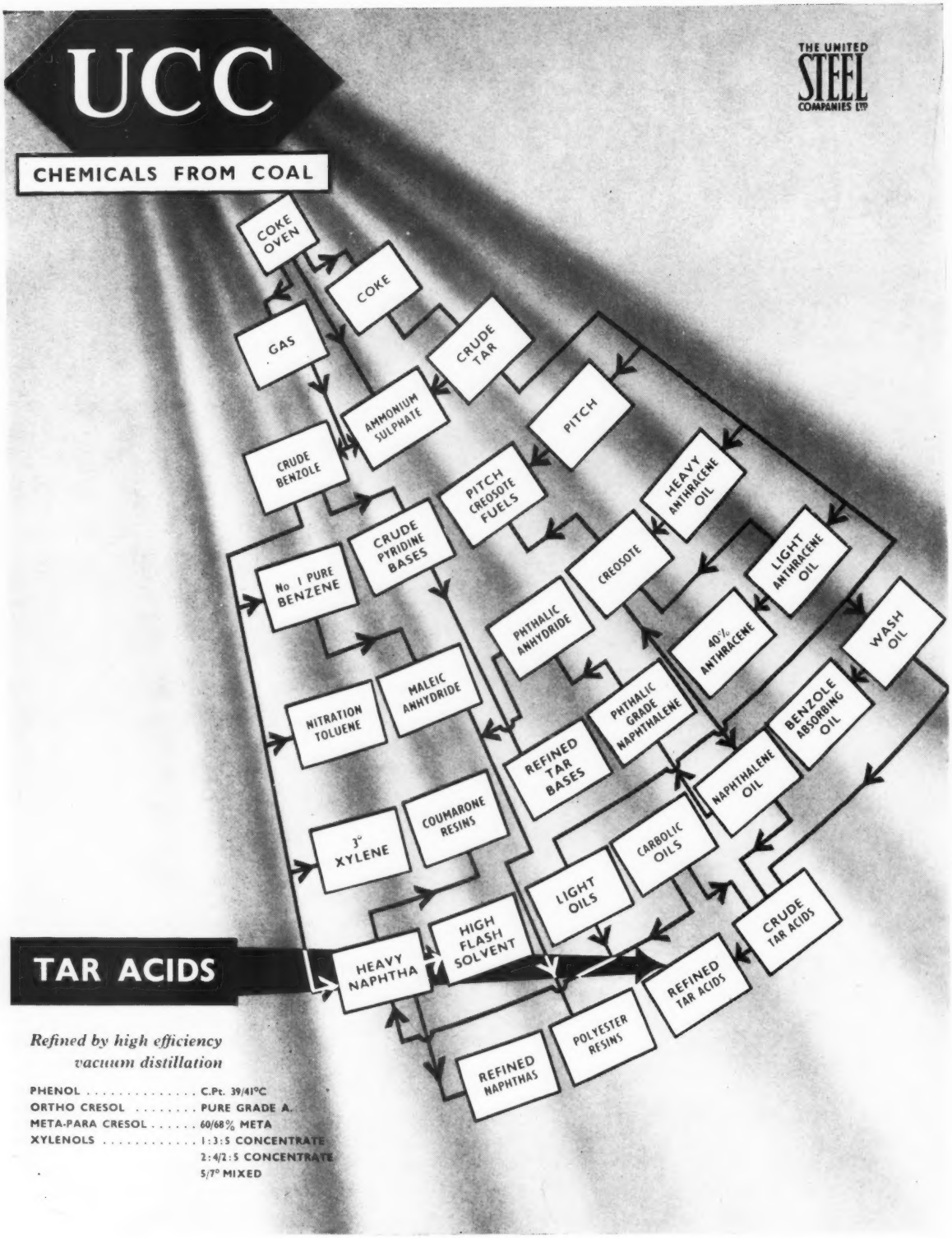


*Enquiries to :*

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*Telephone : Sheffield* 63025 *Telegrams : ' Unichem ' Sheffield*

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*Kleestron make a comprehensive range of general polystyrenes and impact materials · · · and will gladly supply technical details, prices, etc.*

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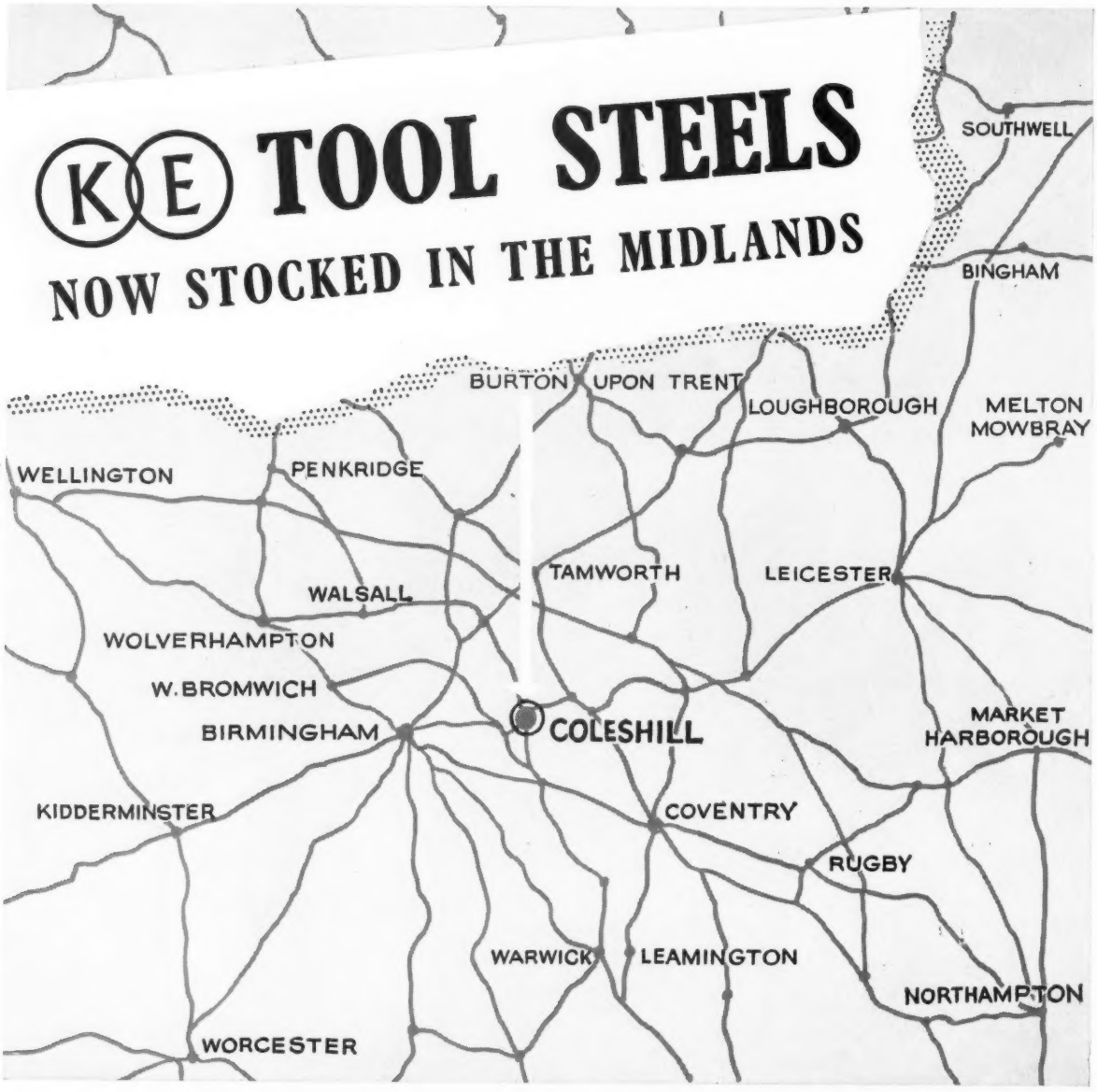


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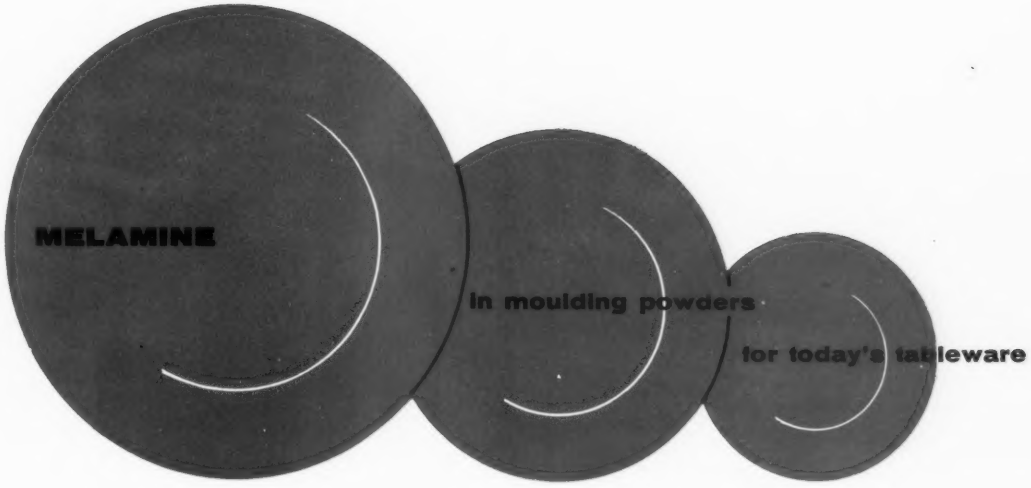


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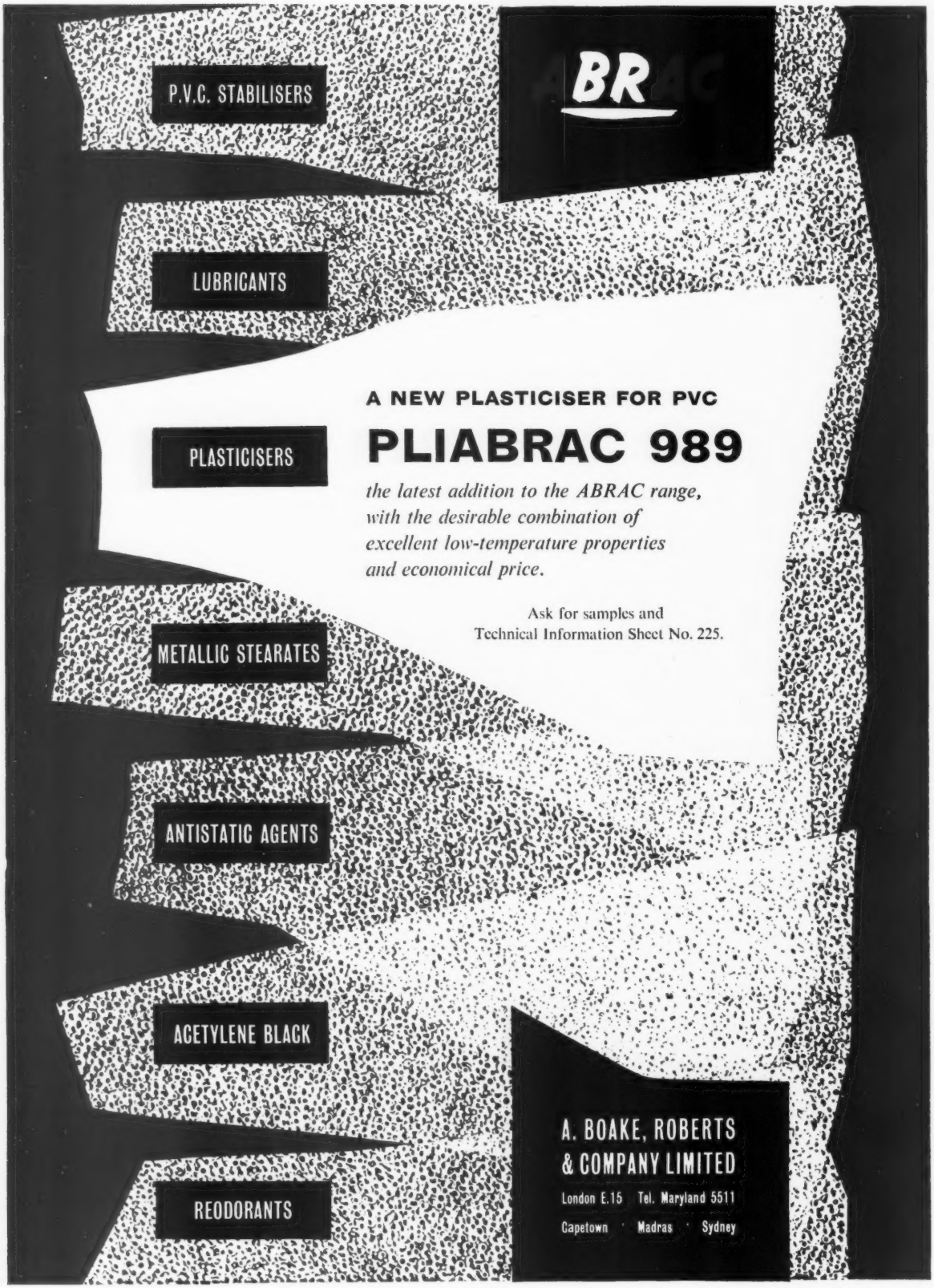
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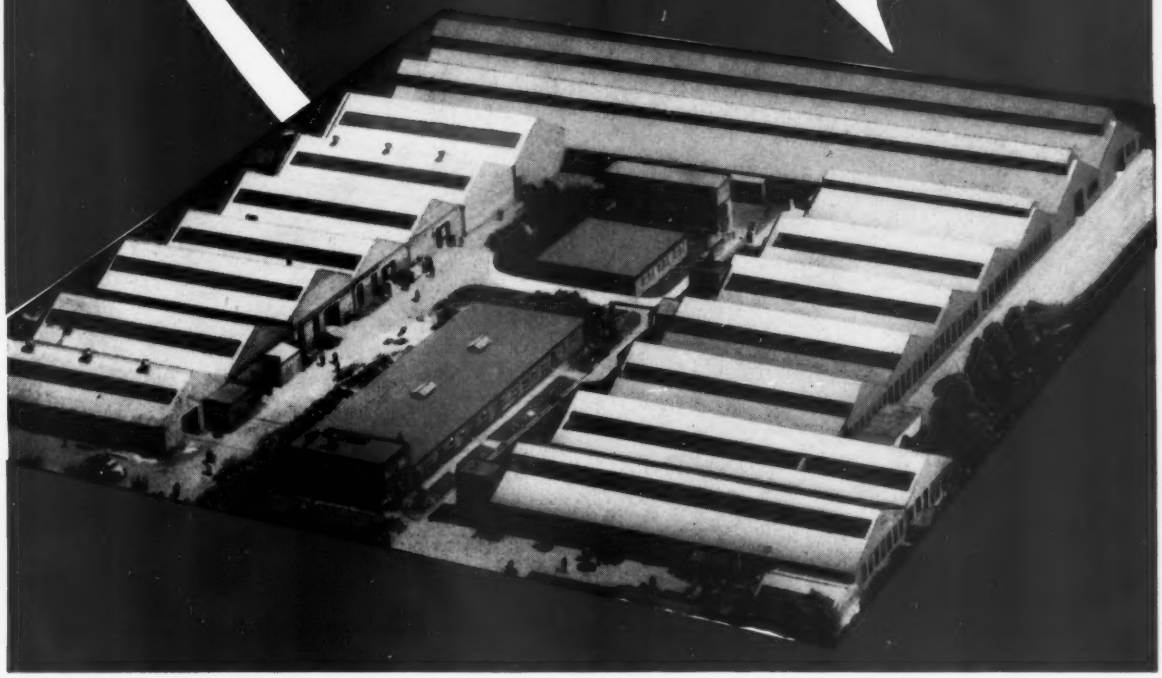

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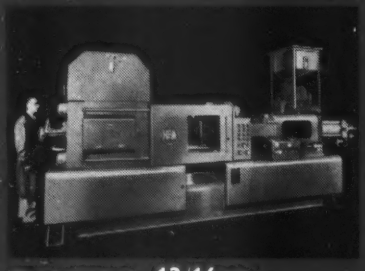
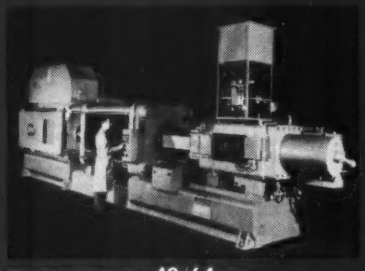


**Model 300-H-12** 12/16 oz.

| | |
|---|---|
| Plasticizing Capacity | 135 lb/hr. |
| Size of die platen | 10" x 33" |
| Maximum die space | 30" deep |
| Floor area | 18' 6" x 5' 5" |



**Model 800-H-48** 48/64 oz.

| | |
|---|---|
| Plasticizing Capacity | 300 lb/hr. |
| Size of die platen | 55" x 55" |
| Maximum die space | 55" |
| Floor area | 28' 3" x 7' 1" |

**Plastics**

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The new H.P.M's carry on the tradition of " bigness " in performance earned by the line over many years.

Big daylight and stroke, and big plasticizing capacity, out of all proportion to the modest floor area required, makes them the most economical plastics injection proposition today.

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The advanced design heating chamber is big in performance too, plasticizing up to 200 lbs. of Polystyrene an hour, according to conditions.

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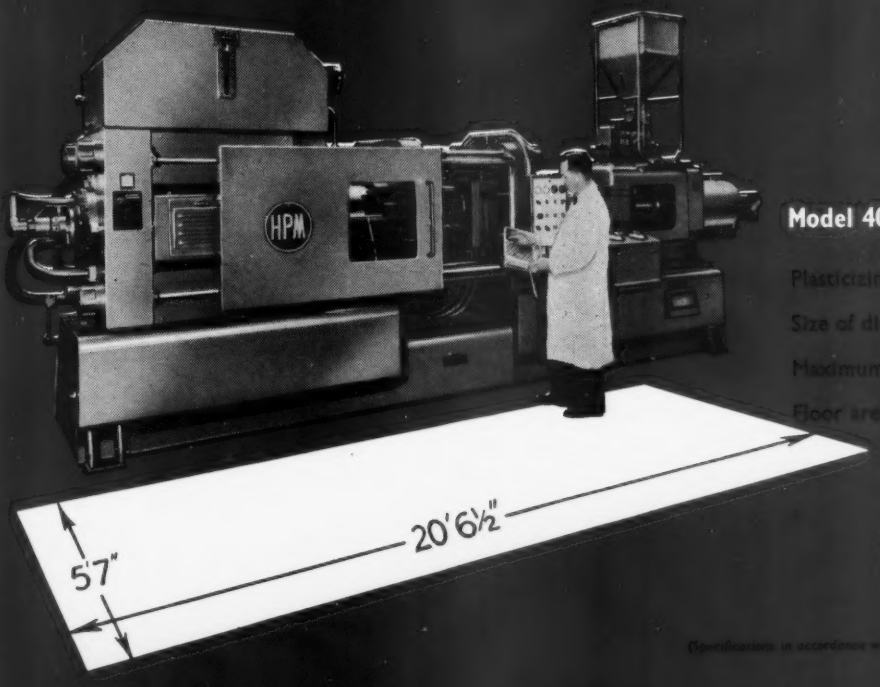


**Model 400-H-20** **20/28 oz.**

| | |
|---|---|
| Plasticizing Capacity | 200 lb/hr. |
| Size of die platen | 36" x 42" |
| Maximum die space | 40" deep |
| Floor area | 20' 6½" x 5' 7" |

(Specifications in accordance with recommendations of British Plastics Federation)

## Injection Moulding Machines

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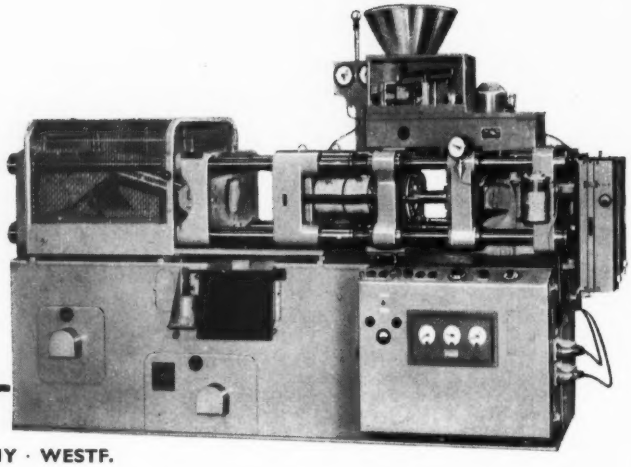

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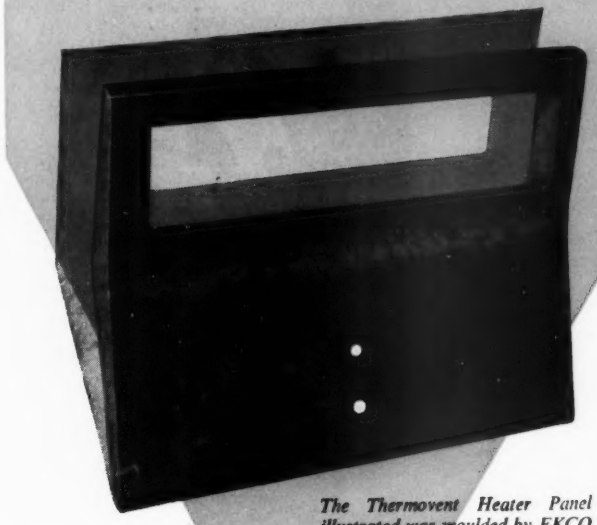
# STERNITE

# MOULDING POWDER

*The Belvedere Toilet Assembly illustrated was moulded by EKCO PLASTICS LTD. in Sternite general purpose grade SPF. 34/3.*



*The Thermovent Heater Panel illustrated was moulded by EKCO PLASTICS LTD. in Sternite cabinet grade SPF. 41.*

The comprehensive range of Sternite phenolic moulding materials includes a wide variety of general purpose and special purpose types including Telephone Grade 1, H.D., Low Loss, Medium Shock, Water, Heat, Acid and Alkali resistant grades, conforming to BSS.771, M.o.S., A.I.D., Post Office and Admiralty requirements.

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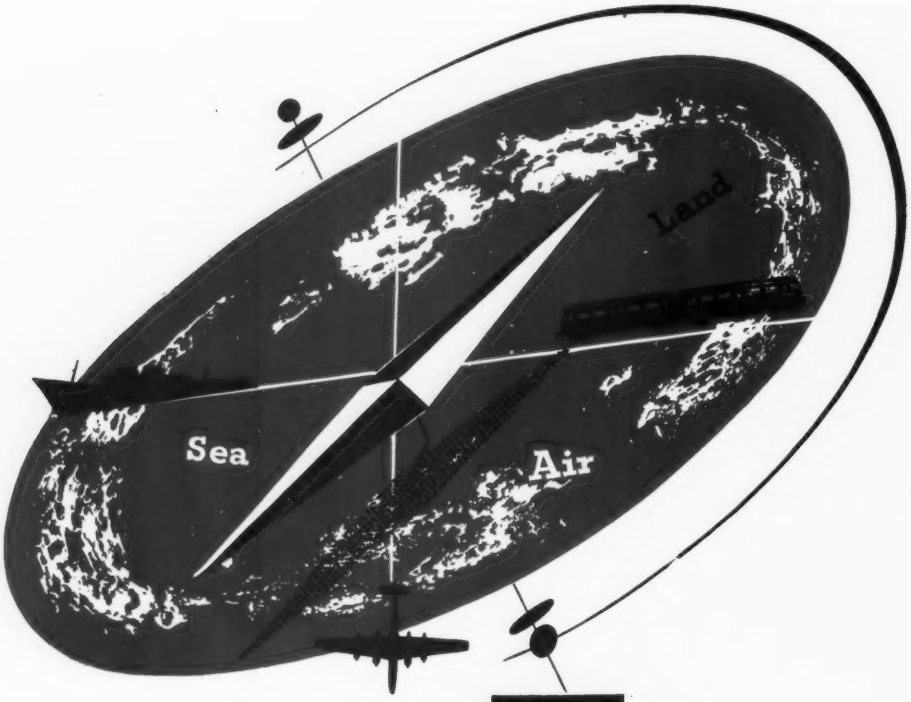


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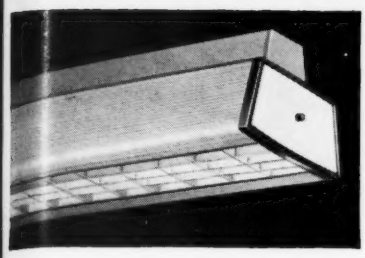
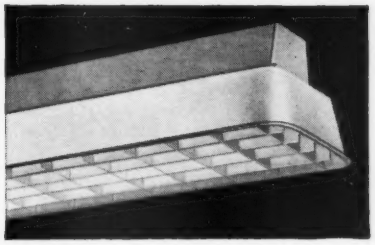
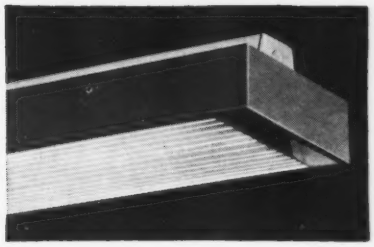
what's so new about
fluorescent fittings







# these anyway?

***Everything is new!*** *The '101 Range' is an entirely new range of contemporary styled industrial, commercial and decorative fluorescent fittings. The successful result, in fact, of team work between G.E.C. fittings designers and illuminating engineers. Competitively priced—outstandingly modern in conception! NEW also is the introduction of basic channels for single or twin tubes, 1½ ft. to 8 ft. which, with specially designed attachments, form an interchangeable system of great versatility with particularly simple installation and maintenance. It is important that you learn all about this exceptional range —the '101 Range'—of G.E.C. fluorescent fittings, so write for fully descriptive catalogue No. F 4068.*

## new adaptability

The G.E.C. '101 Range' sets a *new standard* of adaptability. Using as a basis, channels of common cross section, industrial, commercial and decorative fittings are built without a multitude of small parts. Each is a soundly engineered fitting, of modern appearance and incorporates many aesthetic and mechanical refinements. Installation and maintenance are absolutely simple.

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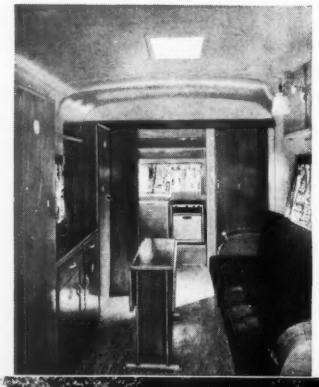
G.E.C. 101 range

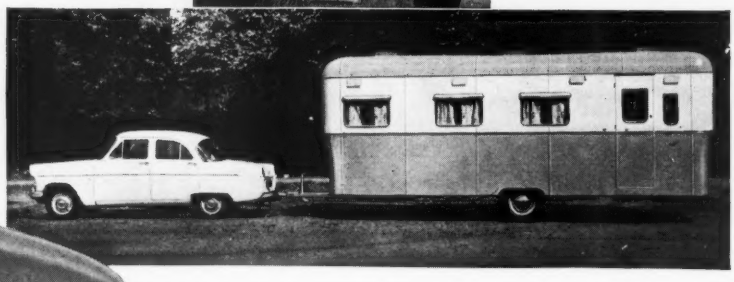
# fluorescent fittings

**THE REALITY OF A COMPLETE LIGHTING SERVICE**

# *Five-point star in the new 'Sunquest'*

CELLOBOND
POLYESTER RESINS





The 22 ft. 'Sunquest' caravan with components in Cellobond Polyester Resins reinforced with glass fibre, by Thomas Hosking Ltd, Cardiff.

BRP *Cellobond is a reg'd trade mark.*

Five major advantages of Cellobond Polyester Resin glass fibre laminates are built into the 'Sunquest.' The roof, the end sections and many interior fittings show the benefits of construction with this most modern, most versatile all-plastics material.

* **weight saved** the 'Sunquest' weighs only 30 cwt— the lightest caravan of its class and size.
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For complete information about Cellobond Polyester Resins write for Booklet No. 56.

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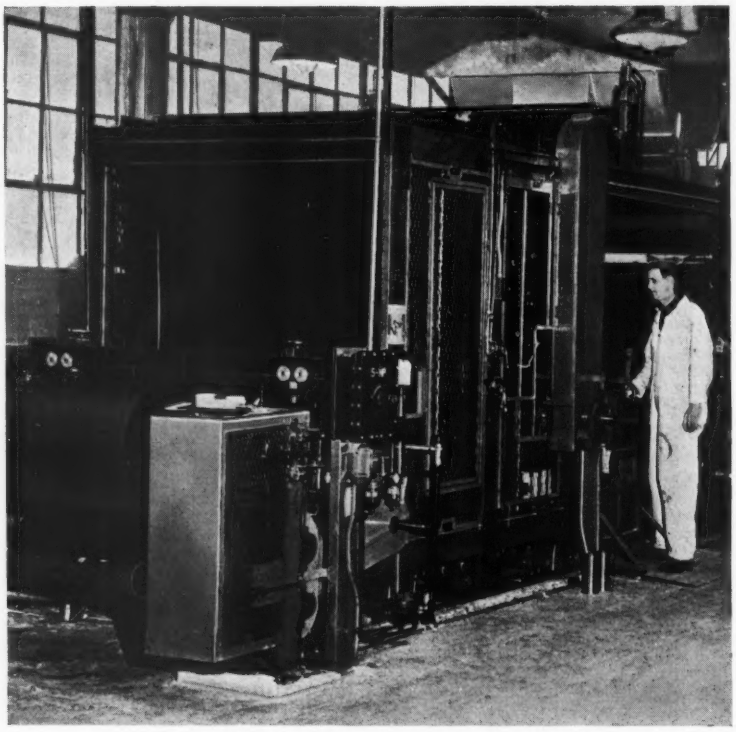

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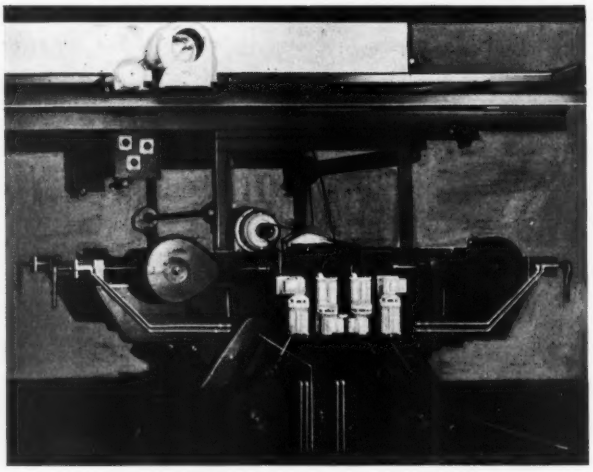
**Optional equipment available at extra charge.



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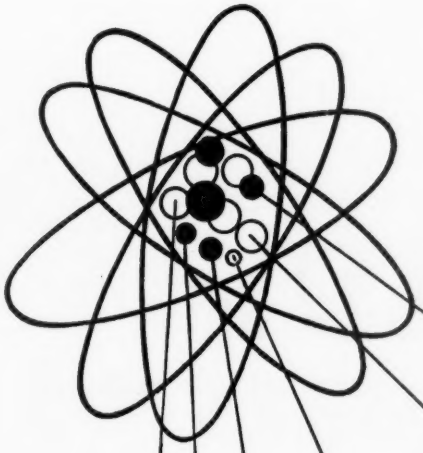

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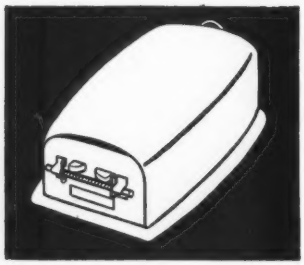
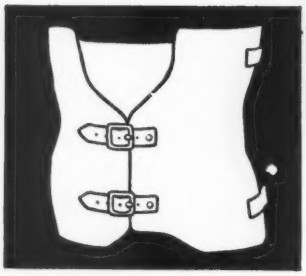
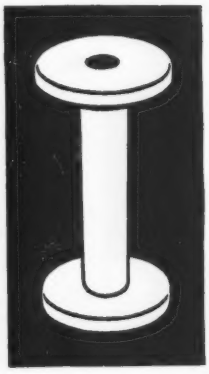
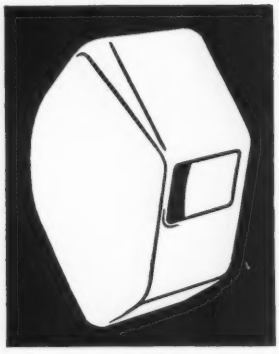






# MOULD with DURESTOS

REGD



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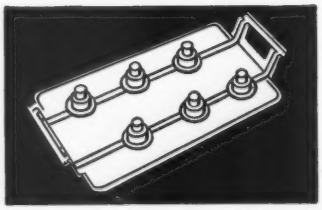

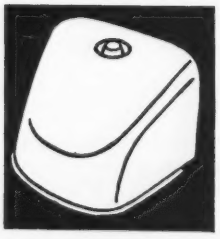

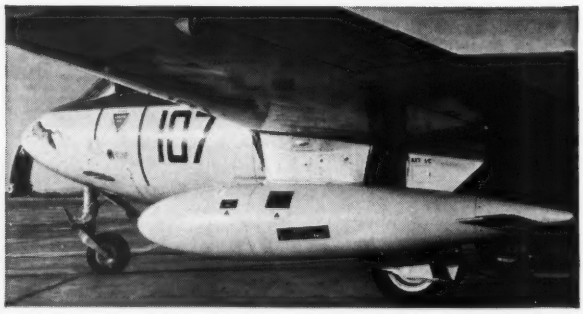

*Full details sent on request*

*75-gallon drop tank in DURESTOS fitted to a Hawker Sea Hawk*
*Photo: Courtesy BRISTOL AIRCRAFT*

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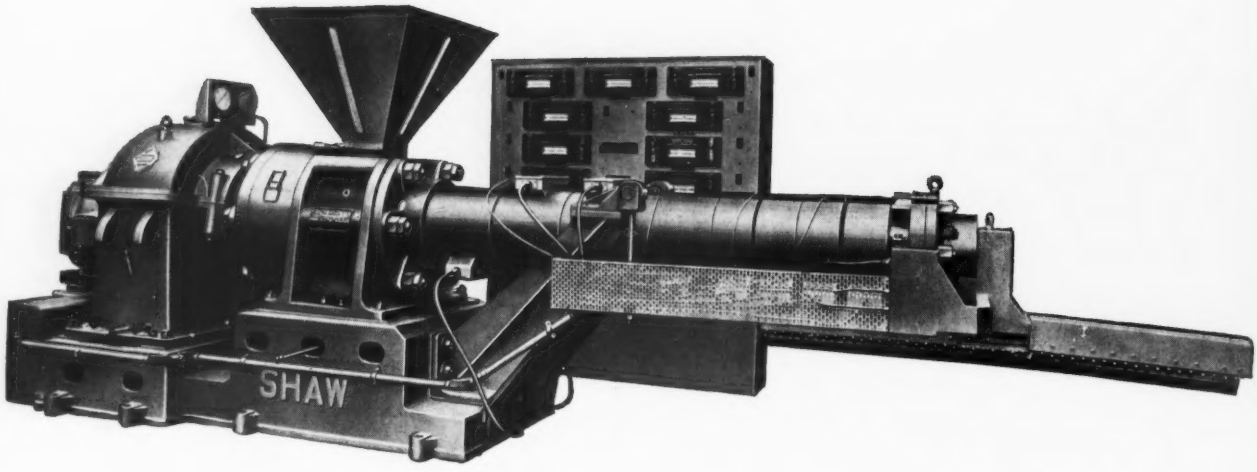


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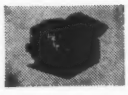

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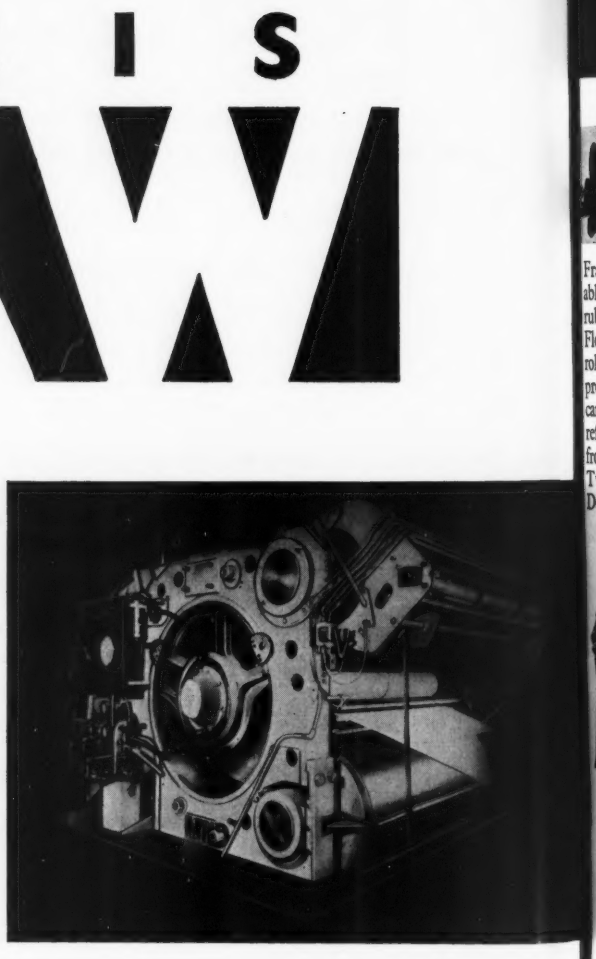

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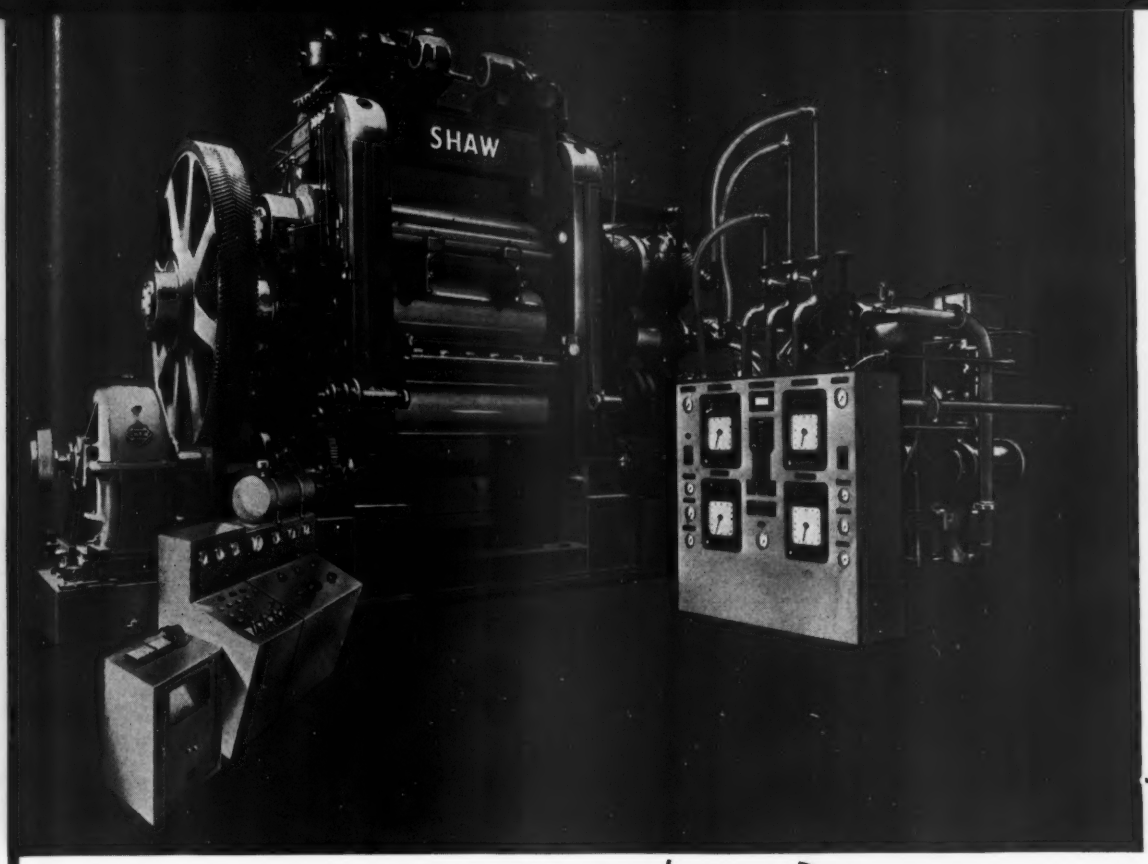
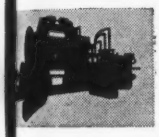



**Francis Shaw are available for the design, manufacture and installation of complete plants**



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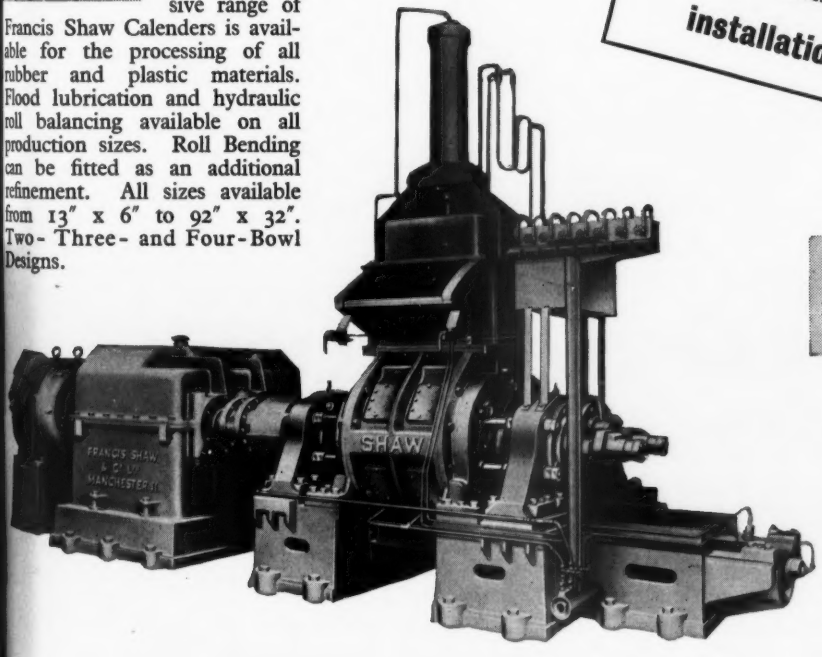


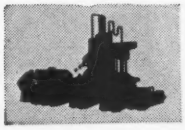

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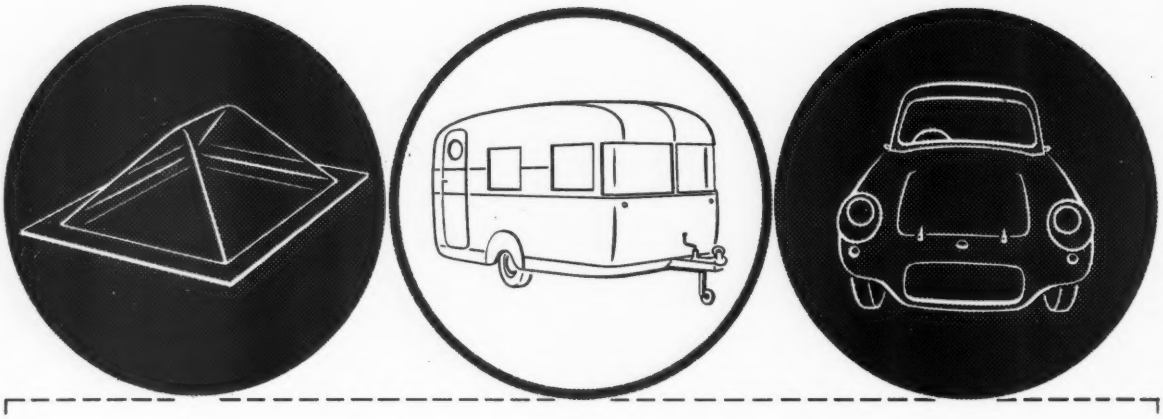

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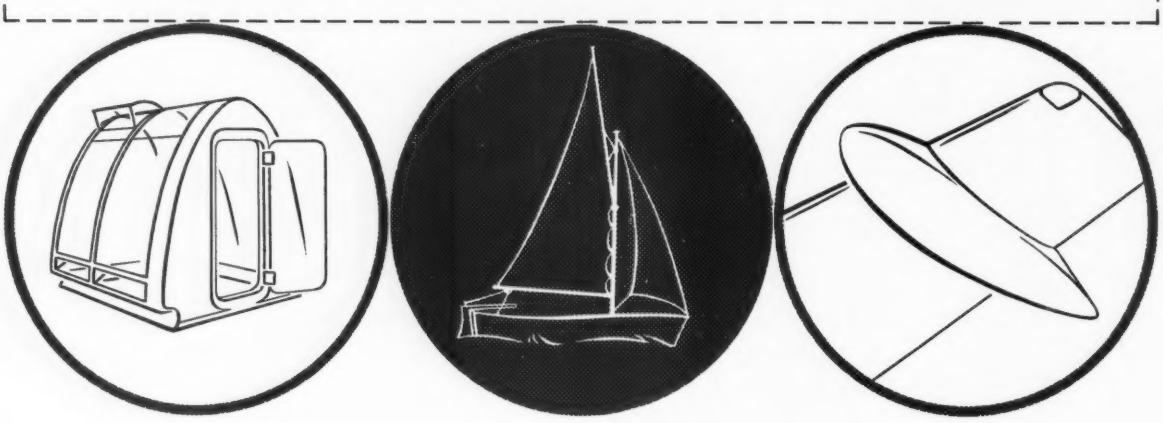

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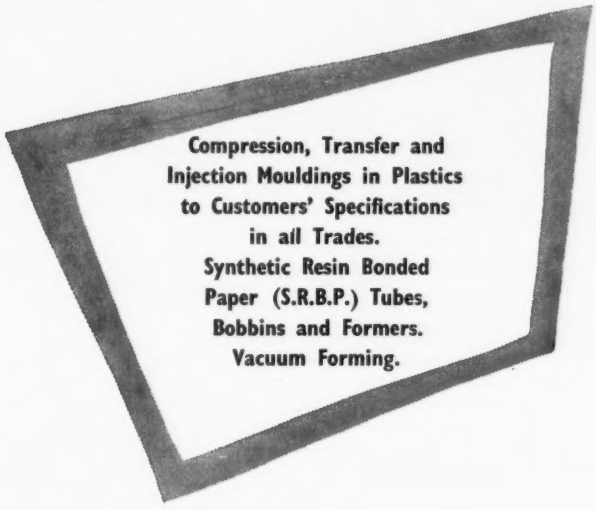


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# *Phenolic cure times reduced by 10:1* ★

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Radyne 5kW preheater
Model H30 Price **£650**

**RADYNE**

**NEW PREHEATERS**

## ★ *here's the proof*

Tests were carried out at the 1957 British Plastics Exhibition, using a fast cycling press developed by T. H. & J. Daniels Ltd. The moulding was an ash tray in black phenolic material, 0.15" thick, 12 sq. ins. area and weighing 2 ozs.

*Test 1. Without preheating.* Cure time 2½ minutes.

*Test 2. Normal preheating.* 110°C in 30 secs. Cure time 1¼ minutes.

*Test 3. Rapid Cycle Moulding* Temperature 375°F: Pressure 12 tons.

**Preheating 7 secs. on Radyne 5 kW preheater to 140°C** Cure time 15 seconds — **a reduction of 10:1.**

*Production Trebled*
6 oz. phenolic moulding with low temperature pre-heating 15 per hour. With Radyne high-speed, high temperature preheating **48 per hour.**

**Costs halved:** total cost with low temperature pre-heating — 1s. 8d. each. Cost with Radyne high-speed, high temperature pre-heating — **11d. each.**

| *Preheater power output* | *Weight of moulding material heated to:* | | |
|---|---|---|---|
| | *200°F (93°C) per minute* | *250°F (120°C) in 30 seconds* | *300°F (150°C) in 10 seconds* |
| 1 kW | 14 oz. (400g) | 3½ oz. (90g) | 0·7 oz. (20g) |
| 2 kW | 1¾ lb. (800g) | 6½ oz. (180g) | 1½ oz. (40g) |
| 5 kW | 4½ lb. (2Kg) | 1 lb. (450g) | 4 oz. (120g) |
| 6 kW | 5½ lb. (2.4Kg) | 1¼ l.b (540g) | 5 oz. (142g) |
| 9 kW | 7½ lb. (3.3Kg) | 1¾ lb. (800g) | 7.5 oz. (213g) |
| 18 kW | 14½ lb. (6.6Kg) | 3½ lb. (1.6Kg) | 15 oz. (425g) |
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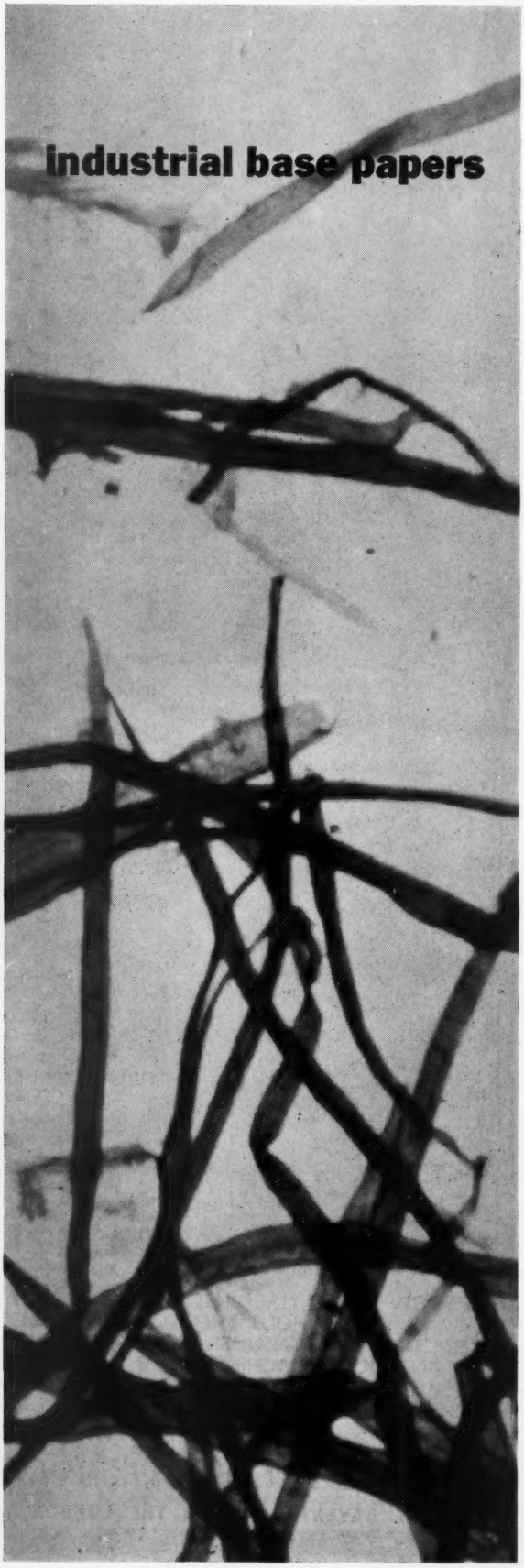

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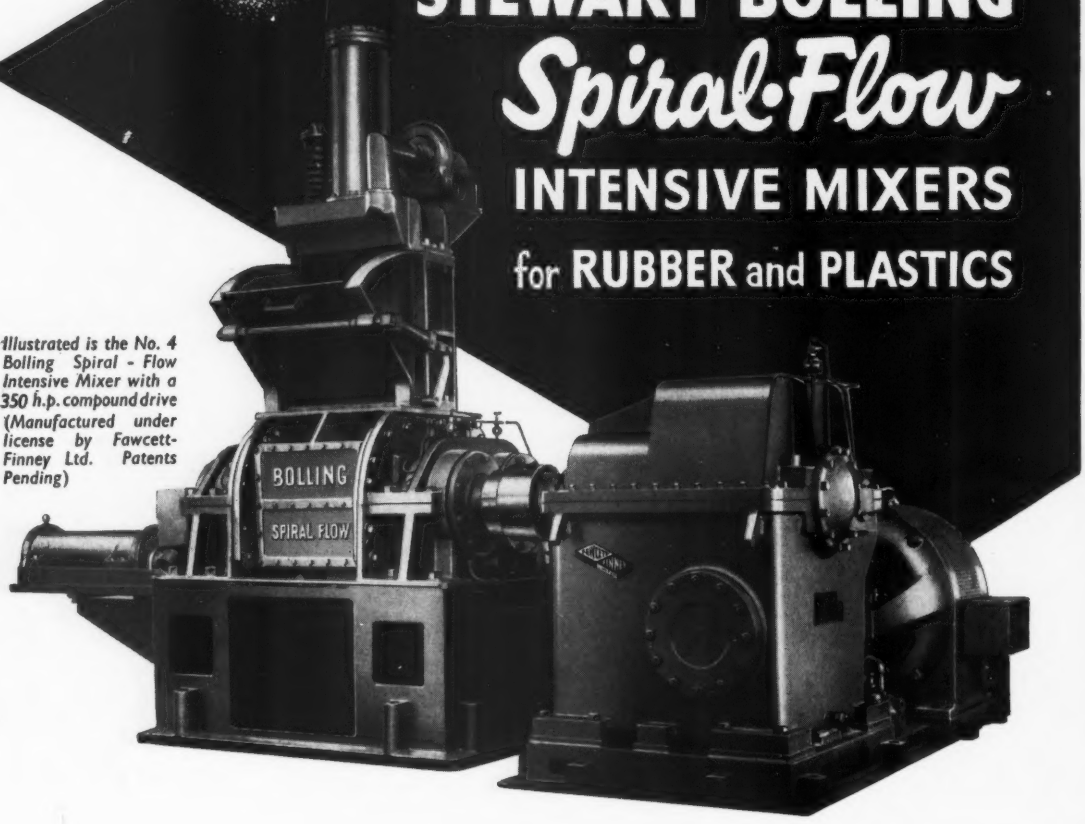
***Spiral-Flow***

**INTENSIVE MIXERS**

**for RUBBER and PLASTICS**




*Illustrated is the No. 4 Bolling Spiral - Flow Intensive Mixer with a 350 h.p. compound drive (Manufactured under license by Fawcett-Finney Ltd. Patents Pending)*

Designed and built to meet today's heightened demands for production BOLLING Spiral-Flow INTENSIVE MIXERS give high-speed uniform mixing and increased capacity with less power consumption and lower maintenance costs. BOLLING MIXERS excel on Polythene and on Butyl rubber where much higher temperatures than normal are required and temperatures up to 400°F. can be catered for employing flood lubrication. Chamber capacities from 200 to 16,000 cu. ins. are available to handle 4 to 500 lb. batches. Let us know **YOUR** requirements — we shall be pleased to advise you and supply further details.

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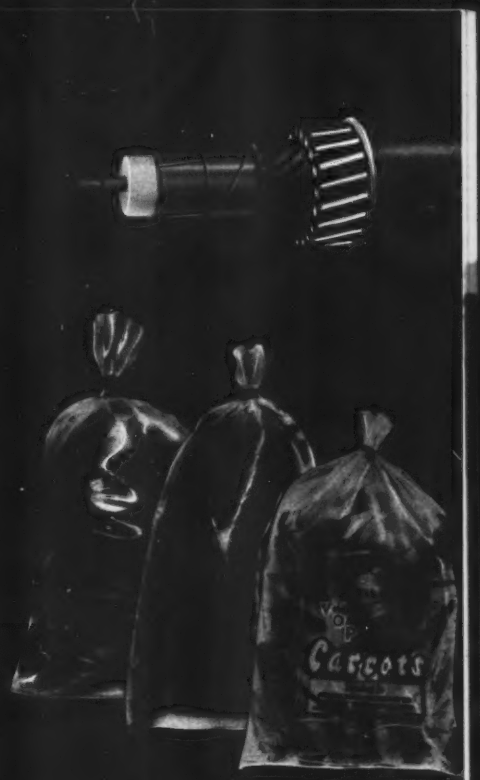

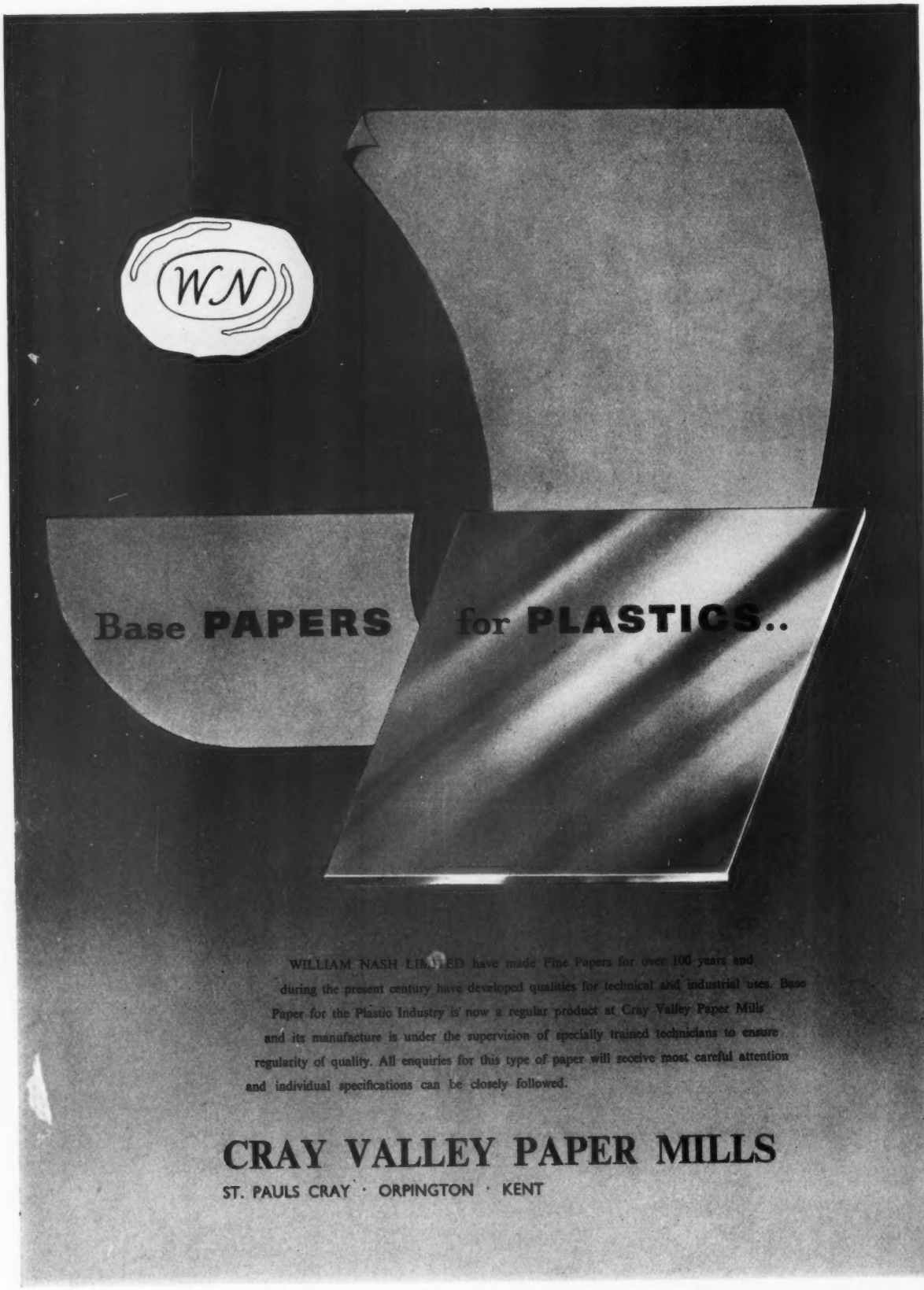


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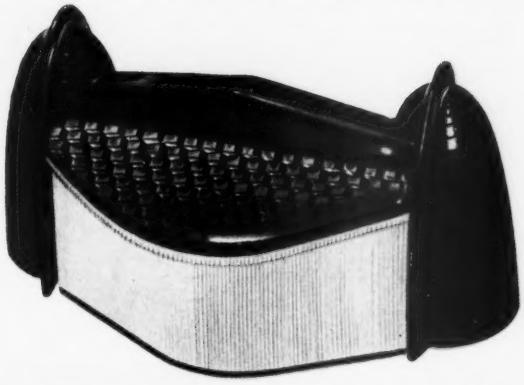

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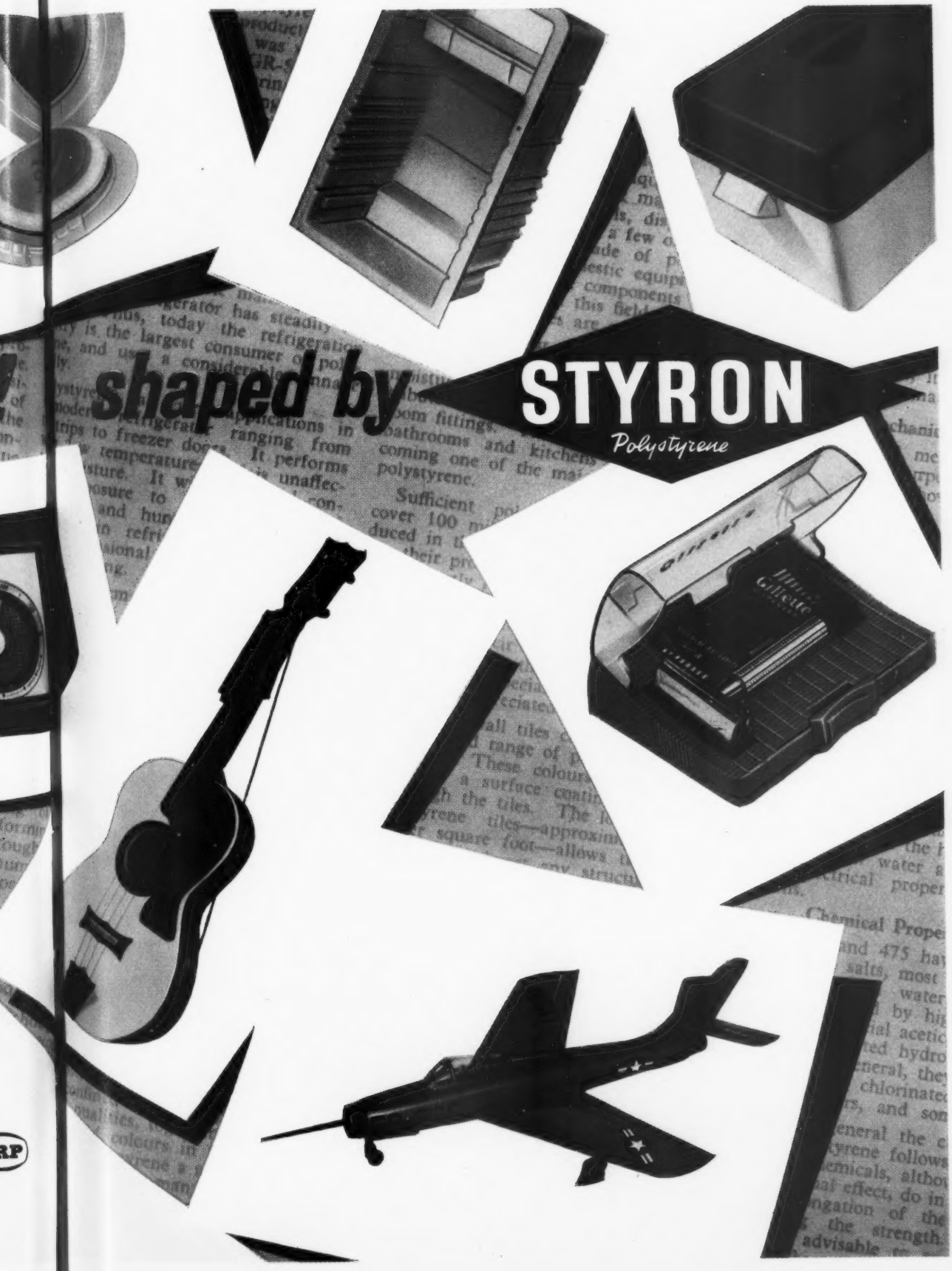
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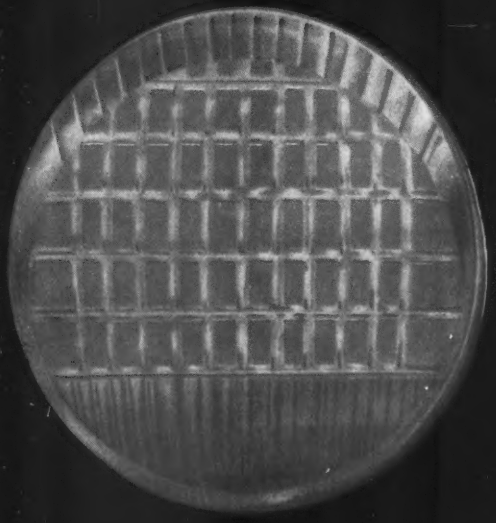

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# 'Perspex' helps to picture the silent world

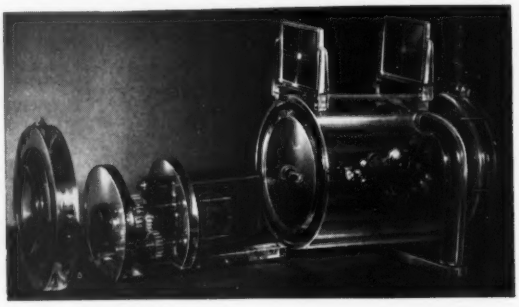
PHOTOGRAPHING nature's deep water secrets sets special problems for camera design. That is why 'Perspex', the versatile I.C.I. acrylic sheet, has been used for this entirely new underwater camera case. Designed and manufactured by Stanley Plastics Ltd., Chichester.

'Perspex' eliminates completely the disadvantages of a conventional metal case — corrosion, condensation and obscured visibility. A full system of "extended control" means that the camera can be operated with greater ease under water; and the prototype has been successfully tested at depths down to 200 ft. at a pressure of 95 lbs./ sq. in. The case is adaptable to nearly all types of camera.

**'PERSPEX'**

*is the registered trade mark for the acrylic sheet manufactured by I.C.I.*

This 'Perspex' ciné camera case is only one example of the way research is developing the use of I.C.I. plastics in all branches of industry.



*This "exploded" view of the new underwater camera case shows the strips of fluorescent 'Perspex' framing the sights, here in the erect position. The clarity of the 'Perspex' cylindrical case allows lens settings to be seen without the provision of external markings or click stops.*

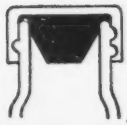
ICI

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1.

P.632

1 Closure in open position

2 Closure in half sealed position

3 Closure in fully sealed position 

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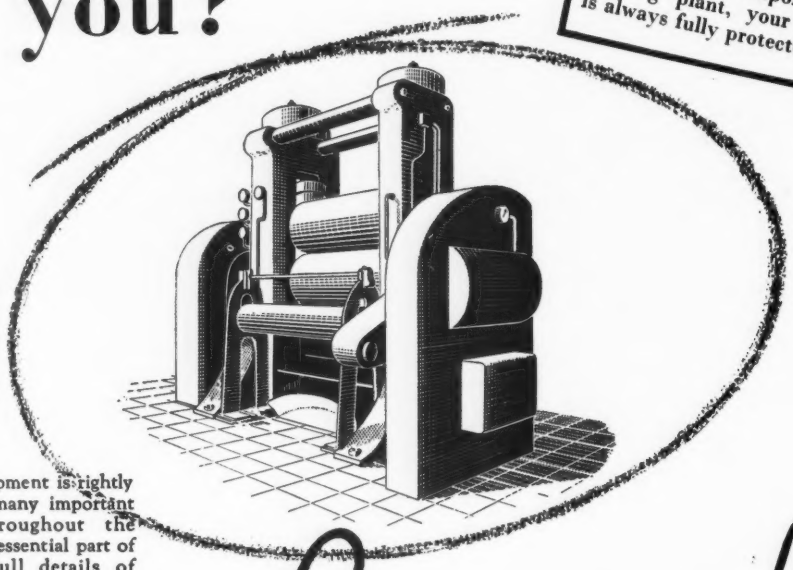

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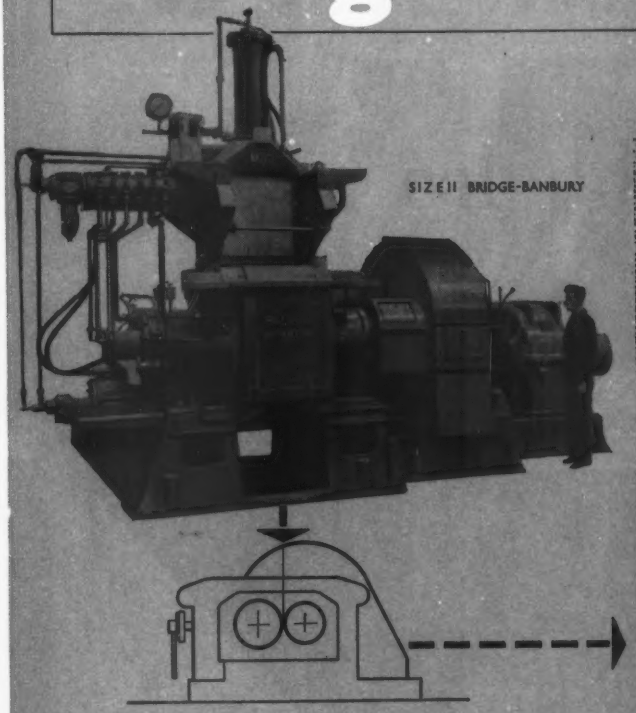


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### FOR BRIDGE-BANBURY MATCHED PRODUCTION UNITS

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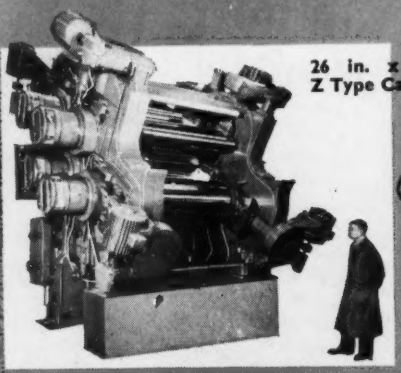
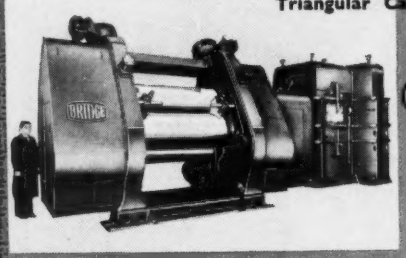
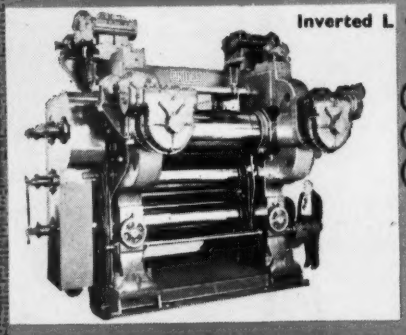


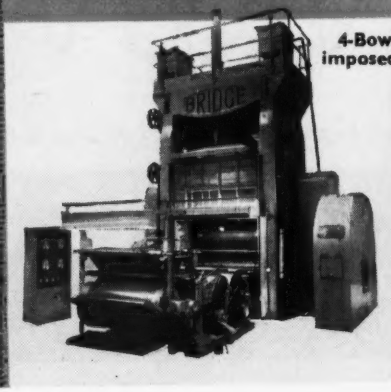
26 in. x 66 in. Z Type Calender I




Triangular Calender



Inverted L Calender




4-Bowl Superimposed Calender

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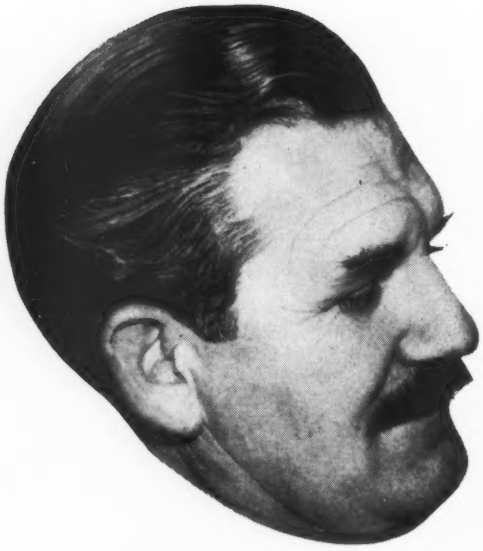

# "Well, it certainly looks all right"

*That's about as far as any intelligent engineer will go, the first time he's confronted with a new kind of temperature controller. Very sensible of him, too. For without firsthand evidence of its work on his projects, how can he judge its performance against all the others.*

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West have every confidence in their instruments. But they recognise that it's necessary to pass that confidence on to you. We want you to be sure that West temperature control really is best for your specific moulders and extruders. And this is how we do it.

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*JP PROPORTIONING TYPE CONTROLLER, shown here, works within very fine tolerances, corrects for thermal inertia, does not overshoot control points. All components under-run for reliability. No thermionic valves; extremely robust. No transistors: unaffected by ambient temperatures. Control unit simply unplugs for service or replacement.*

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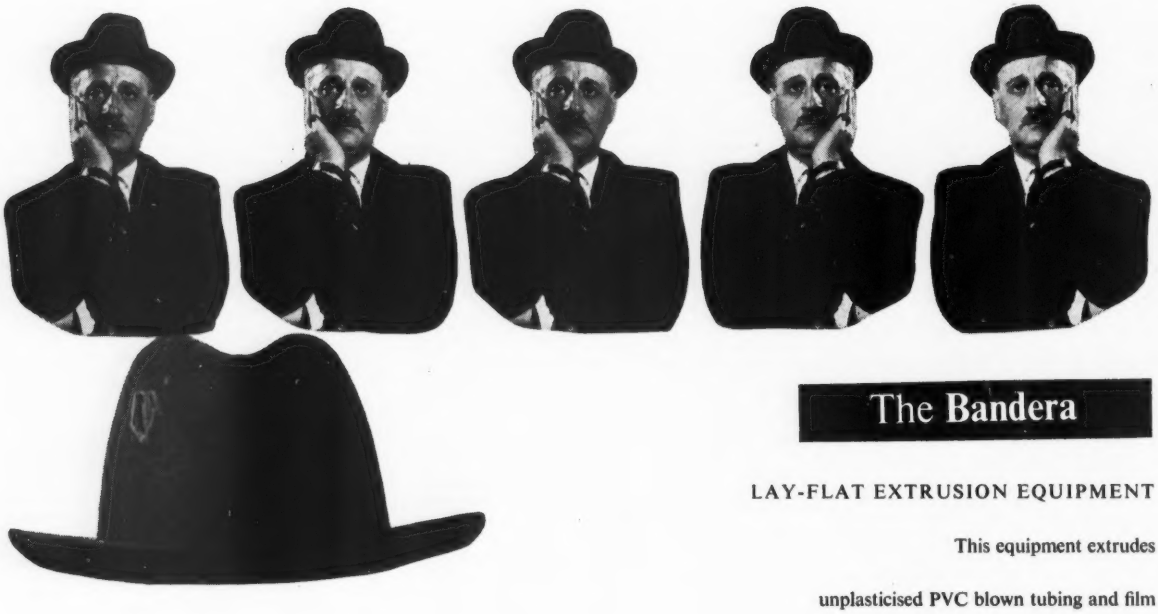

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LAY-FLAT EXTRUSION EQUIPMENT

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Output from 15 to 150 lb./hour.

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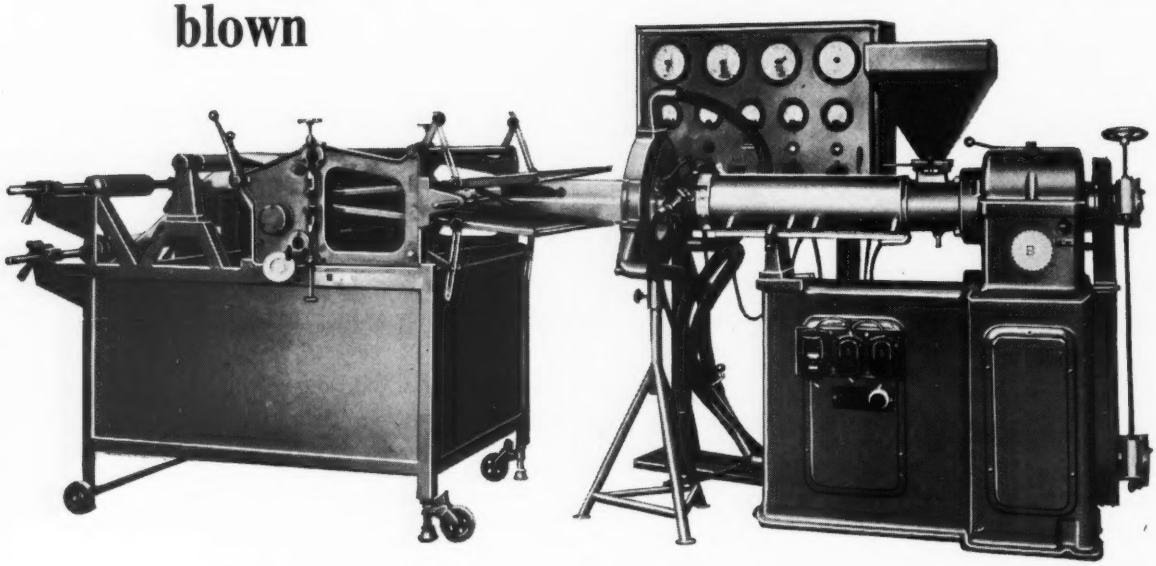

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For we are plastic-proud; we *like* people to say "I always send my stinkers to Derwent"; and we turn out a dozen or a million stinkers matching the model with absolute precision.

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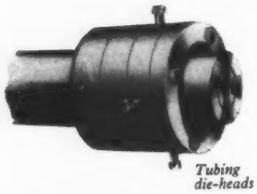
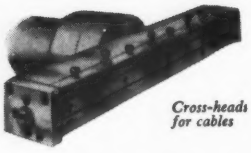
*Illustrating Plastic Extruder Type XT*

***separate control panels and full range of auxiliary equipment available***

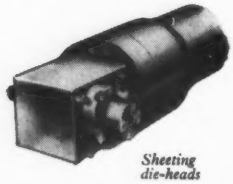


*Tubing die-heads*

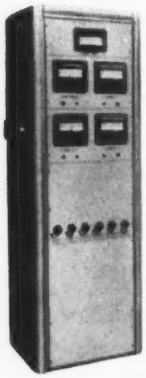
*Lay-flat heads*



*Cross-heads for cables*



*Sheeting die-heads*



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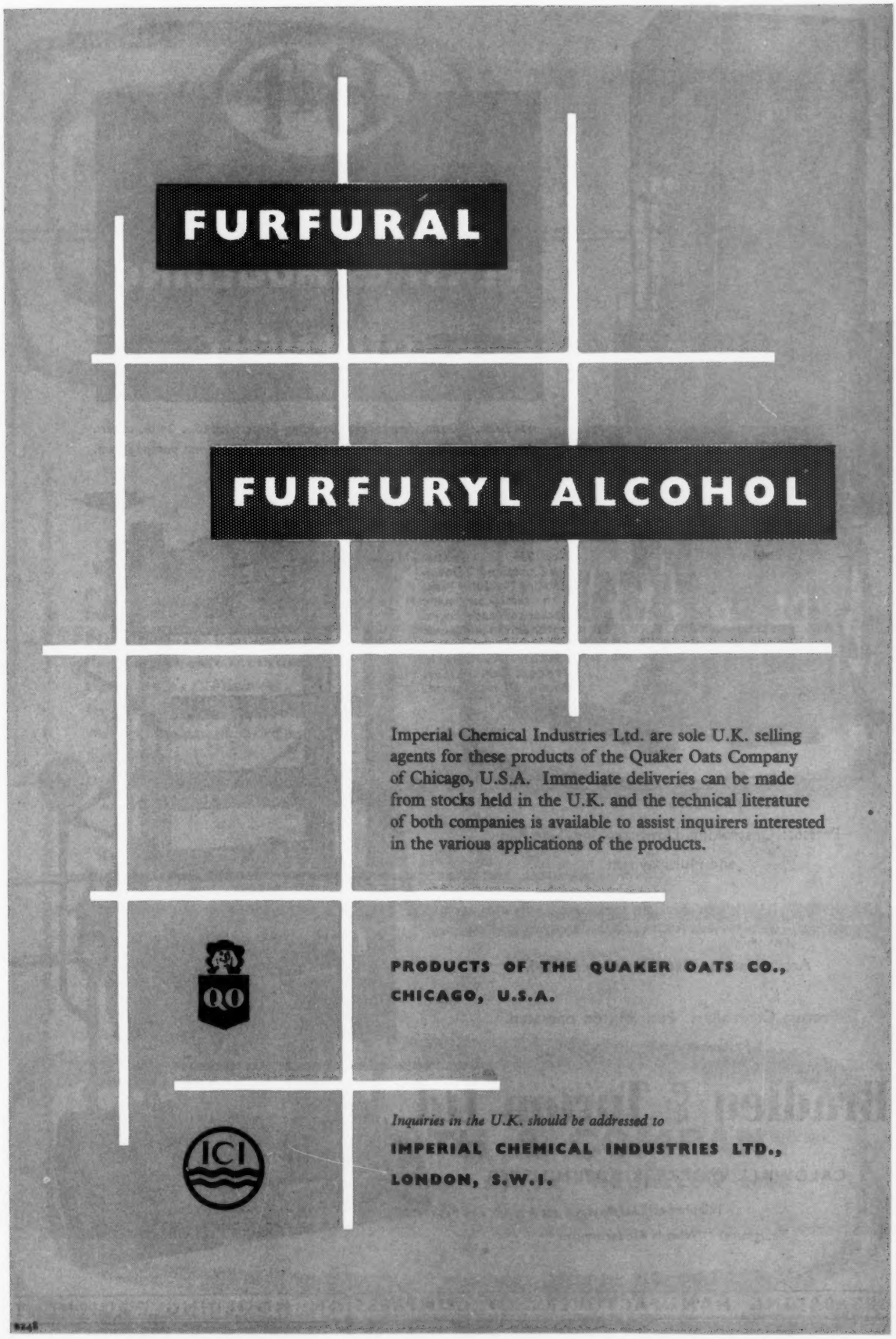
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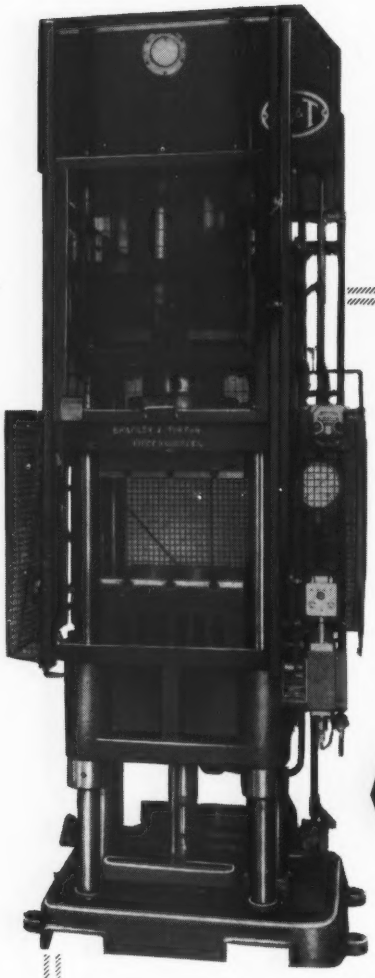

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*Resin suppliers: Scott Bader & Co., Ltd.*

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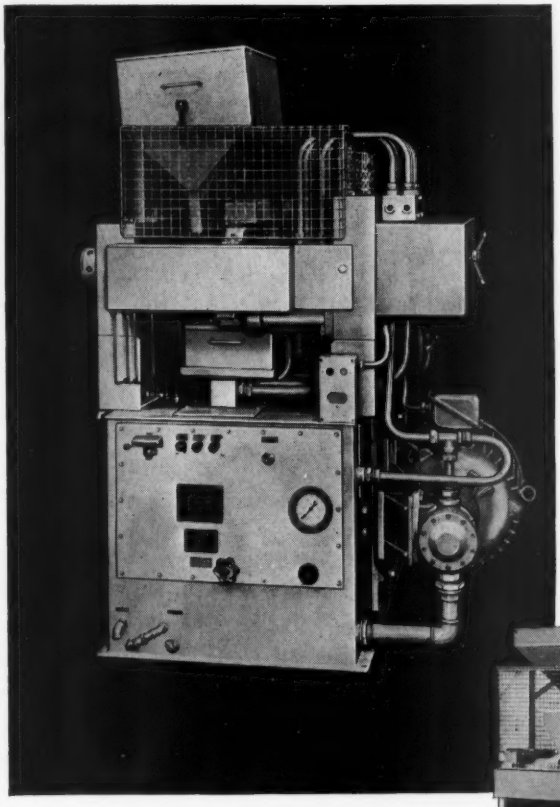
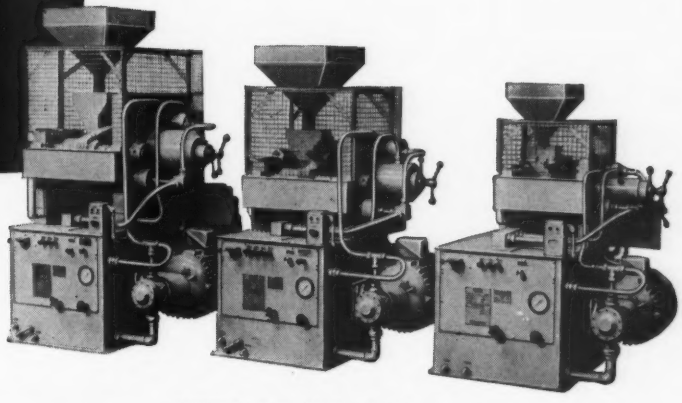
## for the modern moulder



BIPEL pelleters differ entirely from conventional types. They are horizontal, are hydraulically operated and form the pellet by a steady squeeze instead of a sharp blow. Tool breakage is practically unknown, production rates are high and the BIPEL machine will often pellet materials considered unpelletable by ordinary machines. Single and multi-punch types are available and the range of sizes has been designed to meet all likely requirements.

*BIPEL 35-ton multi-punch horizontal hydraulic pelleter. Makes pellets of $\frac{1}{8}$"–$\frac{1}{4}$" dia. at rates of up to 25,000 per hour. Tool changing takes less than half an hour.*



*BIPEL horizontal hydraulic pelleters. Three Types—12 ton, 35 and 70 ton—offer respective pellet sizes of $\frac{1}{8}$"–$1\frac{3}{4}$", $1\frac{1}{4}$"–3" and 2"–$4\frac{1}{2}$". Respective maximum rates of production (with single punch) are 2100, 1260 and 720 pellets per hour.*

***These pelleters typify BIPEL policy—to produce a complete range of novel, virtually foolproof equipment offering higher productivity and considerably lower operating costs all round. No other system of moulding in this country provides a comparable combination of flexibility, productivity and economy.***

*The* **BIPEL** *System of hydraulic moulding*

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DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

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*Fraser and Glass Ltd., as noted elsewhere in this issue, have recently celebrated 25 years as a limited company. In the photograph above can be seen a bank of compression presses at the Company's Finchley works.*


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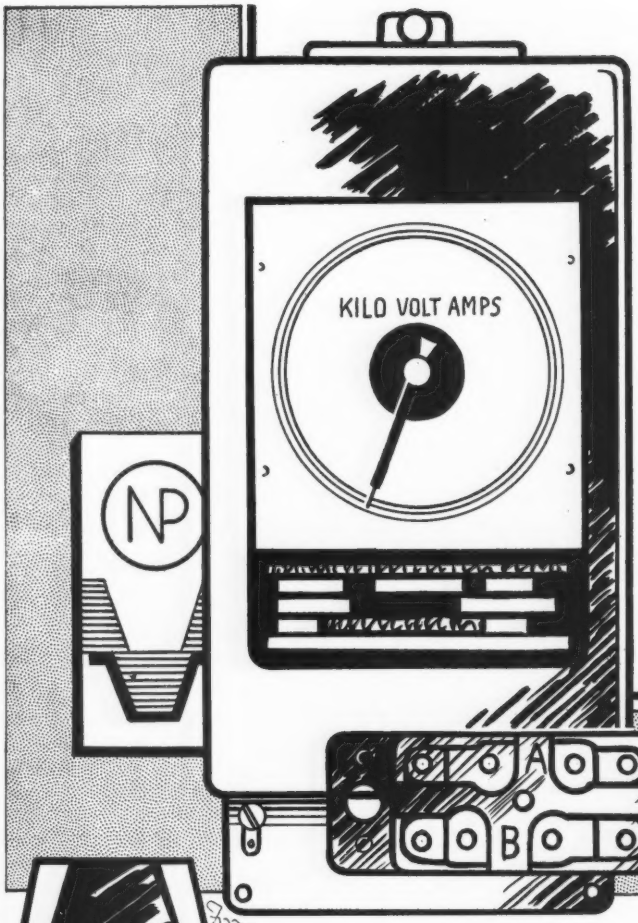
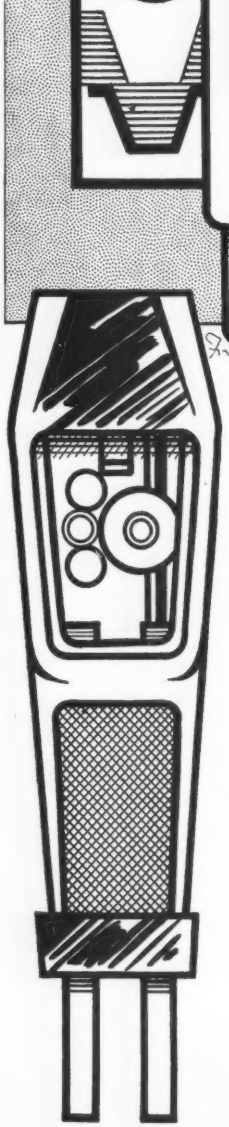



# so many electrical developments depend upon National Plastics



. . . because National Plastics is an organisation specialising in the production of *industrial* plastics in very large quantities.
Whatever the product — electricity meter, domestic washing machine, radar system or television set — plastics mouldings and extrusions play their important but often invisible part.
It is the special job of National Plastics to collaborate with producers of all sorts of industrial equipment, to stick to the problem until it is solved and finally to put the plastics product into swift, large-scale production.
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Plastics

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# EDITORIALS

## The Free Trade Area

THE record attendance of some 190 members of the London Section of the Plastics Institute at the Wellcome Building, on January 21, under the Chairmanship of Mr. C. W. Welch, was sufficient evidence of the interest and anxiety in the proposed creation of the European Common Market and Free Trade Area.

Two of the guest speakers, Mr. Pinder, of *The Economist*, and Mr. Fisher, of the *Financial Times*, placed the general problem clearly before their audience. The world shocks and economic difficulties caused the formation of Benelux, a working free trade area with considerable power and useful results. To this group of three nations, Belgium, the Netherlands and Luxembourg, have now joined France, Germany and Italy with the object of forming a larger European Free Trade Area, and a common market, free of tariff walls for some 160,000,000 inhabitants.

It is proposed that Great Britain joins this union, which in total population (nearly 210,000,000), in industrial power and in scientific and technical ability, could, if it chose, stand higher than any against the economic onslaughts of the rest of the world.

The question before us might seem to be: shall we join, or shall we stand aloof and develop with the Commonwealth and our colonies which has long been a Free Trade Area as anything can be? On closer examination there seems from all the speeches we have heard or read, that there is no such question at all and that there exists almost no option at all—that we must join or suffer greatly in the future. If we do not we shall have a vast population arrayed economically against us. We could not enter their market at all, but so efficient could they prove with a 160,000,000 home market and consequent low production costs, that they could most likely, surmount our own tariff walls. We should also note that this area now includes a Germany which is once again the greatest producer of plastics and possibly chemicals in Europe, includes a France that appears on the verge of great technical and economic developments especially if her Saharan hopes are fulfilled, an Italy that has now emerged anew as a very technically advanced nation, and the Benelux nations, which for their size, are as technically and economically in the forefront as any.

If we do join the European Free Trade Area we are promised a rich European group that has never before worked in any sort of concert, but which would possess enormous potential.

It will not all be soft going, and Mr. Pinder foresaw that some manufacturing industries (he was speaking of British industry in general) would have to swallow some bitter pills. Mr. Fisher seemed to deny this so far as plastics were concerned and suggested that we should gain more than any other industry. But as he warmed to his task he noted a few sections, especially the machinery section, in which the Europeans were ahead of us, and could give us points in quality, modernity, delivery and high speed sales methods. Inevitably came also the advice to smarten our sales methods, produce what our customers wanted and not what was most convenient for us to manufacture, to polish up our foreign languages, have a common way of talking technical matters, increase research expenditure, etc.

The guest speakers within the plastics industry itself were Mr. D. Radford, of E. K. Cole Ltd., Mr. E. J. Lassen, of Bakelite Ltd., Mr. Smith, of Halex, who was taken ill just prior to the meeting, unfortunately, but whose paper was read for him, and Mr. C. J. G. Stanley, of the British Plastics Federation, also gave their views of various aspects of the subject: that foreign manufacturers were by no means so advanced as is supposed in sales methods, qualities or deliveries; that the existence of the Channel itself created a price rise and that we should hasten the Channel Tunnel; that our labour must realise the difficulties before us and bring order within its house. (We believe that while the wages within all the countries named and the hours worked are not violently different, it is the productivity per hour of the foreign worker that is considerably greater than our own.)

When the remainder of the evening was thrown open, for general discussion, there were many to raise their voices on the subjects of research, dumping, patents, the British Commonwealth and the necessity of safeguards. In passing, the British Plastics Federation has produced the evidence of a new record in exports of plastics raw materials with a total of 111,800 tons valued at £29,900,000, nearly 14,000 tons over the record level of 1956. Our biggest customer is again Australia with increased purchases valued at over £4,000,000, while France, India, New Zealand, Sweden, the Netherlands and South Africa, all purchased quantities valued at over £1.5 million each. Finished goods or moulded components are not included in these figures.

We understand that the talk will be published at length in the *Transactions* of the Plastics Institute, when we shall be able to comment further on this contentious subject.

## The Future

CERTAINLY we shall have to tidy up "our plastic house" considerably, as our critics demand, for scientific and technical discoveries move faster than ever and he who can afford to be up-to-date, whether it be with raw material manufacture or, in the case of our moulders, with his machines and his knowledge of the new raw materials, will be on the winning side. It needs but a cursory glance at the machine side, for example, to realise the immense strides that are taking place in this field, not only in turning out mouldings faster, but physically and mechanically better because of improved mechanisms, temperature control and better heat transfer which also results in lower spoilage and less waste. These promising developments and those held out to us by the opening up of yet new fields by the newer plastics, are the most encouraging of all. In any event we are in a position very greatly superior to that existing in pre-war days. We are of considerable stature in the petroleum cracking field and this advance has by no means reached its full strength yet.

One of our future worries will be to decide whether or not we can discard certain raw materials and concentrate on a fewer number which may well provide an adequate " overall " coverage for technical and other requirements. The real question may yet be, can we afford to retain them all because there still remains a demand which may be static or even diminishing? This is obviously " heresy " but we may well wonder if it is really worth our while making casein, for example, or other " limited "

material. Again, can we afford to disperse our energies in making the hundreds of different " specialities " that so many factories turn out for almost individual requirements—the hundreds of different (and possibly unnecessary?) colours that customers demand and that create burdensome overheads?

## Boat Show

THE plastic boat, synonymous with glass fibre/polyester, now achieves impressive stature as will be seen from even a cursory glance at the photographs we publish on pages 48 to 50 and taken at the recent Boat Show held at Olympia.

The most impressive of all was the life-boat built at Samuel White's yard, for we now see the immergence of the truly unsinkable vessel by the building-in of a foamed plastic both as a sandwich to the glass fibre/polyester skins and as the complete thwarts themselves which are of considerable bulk. Even when severely holed, full of water or overturned, the boat cannot sink and is in truth a life-saving raft. The resins employed includes the expanded sebalkyd type (which being a cross-linked type possesses its own advantages such as mechanical strength), but as has been seen elsewhere most foams from most resins, with the ease of fabrication of plastics in straight or curved forms from them, will surely occupy the attention of all boat builders for this and other applications.

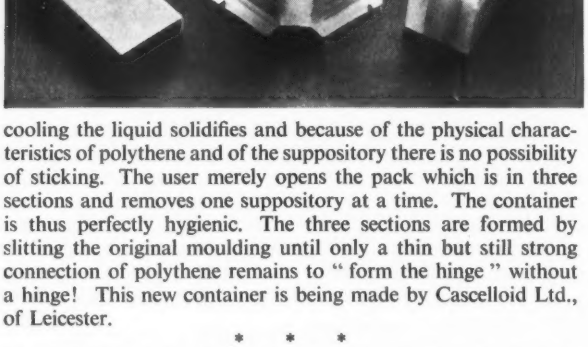
An interesting novelty was seen in the elegant 15 ft. " Dusky Queen " where for the first time, a sheathing of cellulose acetate has been employed to cover the whole structure. The attraction here lies by no means only in the brilliant clean-line effect—the sheathing is also of great strength and abrasion resistant.

Of great satisfaction too, is the wide adoption of p.v.c. as a " must " for the upholstery of seating, for the covering of gunnels, thwarts and cushions where leather cannot even be considered because of water absorption. In this field, most noteworthy are the new p.v.c. fabric-backed types with nylon and Terylene as the backing.

# MOULDING POWDER AND SHOT

It is most satisfactory to find designers and engineers creating new units based specifically on the chemical and physical characteristics of plastics. The photograph below shows a new and intriguing example of this in the packaging field and concerns suppositories. These " medical " compositions, cylindrical or conical in shape, 1 in. × ¼ in. diameter and based on glycerine or similar compounds are normally cast in metal formers and then bottled in glass containers for sale. The ingenious pack shown is moulded in polythene; it is in itself a 10-impression " mould " when closed (see right) into which the warm liquid is filled. On

***Pat on Back for Designer***



cooling the liquid solidifies and because of the physical characteristics of polythene and of the suppository there is no possibility of sticking. The user merely opens the pack which is in three sections and removes one suppository at a time. The container is thus perfectly hygienic. The three sections are formed by slitting the original moulding until only a thin but still strong connection of polythene remains to " form the hinge " without a hinge! This new container is being made by Cascelloid Ltd., of Leicester.

* * *

I was present at the Plastics Institute meeting last month which discussed " The Free Trade Area " and when somebody said we should learn foreign languages in order to get closer to, and understand our customers, I was all for it. But it wants a good deal more than that too. As the Greeks used to say, and as many in the Midlands still say, it also wants " nous," which I believe means brains or common sense. I encountered two cases while travelling in Italy, in which the British " sellers " should have had their heads examined. The first occasion was in 1937 or thereabouts when Mussolini had initiated a splendiferous exhibition in Rome. The British Council or some other official body had erected a structure in it and all that this august body could think of showing was the art of British book production—this at a time when sanctions were in full swing and when I was refused a packet of cigarettes by the tobacconist round the corner, just because my new 50 bob Burton suit made me look like an Englishman! The second occasion was also in Rome, but in 1951, when Great Britain was launching her magnificent " Come to Britain " campaign. A special shop had been taken and our Public Relations Officers had really gone to town. A vast window was plastered with excellent photographs of what the Italians now regard as the British way of life. First picture: Interior of Scotland Yard, handsome bobby listening on telephone and taking notes. Second picture: Two plain-clothes men knocking at door in suburbs. Third picture: same plus miserable looking individual (handcuffed) leaving door of suburban villa. Fourth picture: Up before the Beak. Fifth picture: Handsome warder opens prison cell and miserable individual goes in. If I remember rightly, all this was labelled " British Justice "—and " Come to Britain "!

***Our Selling Technique***

* * *

If the creation of the European Free Trade Area gives cause for anxiety in some hearts, let us admit that it also contains the germ of a movement that all of us have been hoping to see—closer amity and working between nations. And if you want more cheering up don't forget that we have produced Zeta which shows that the British have still their feet well balanced on the ground and will give the world its most urgent demand, a source of power that will be unlimited and cheap; one that will open up the most inaccessible places of the earth and make the deserts grow again. Second class nation be damned! We work for peace and world plenty.

***I'm Getting Excited***

* * *

It's not very long ago that we published some of the unsolved chemical and physical problems that the D.S.I.R. sends us from time to time. This sort of request for help from outside I find very sensible and intriguing. I've sometimes thought that if " failures " in research work were published to create collaboration or reduce redundancy it might prove useful also; but I suspect we'd land ourselves in a morass of uselessness at the same time. These " negative " thoughts come to my mind after reading the last issue of *Vacuum*, published in November, 1957. It contains a strange note: " Mercury balls on polythene sheet exhibit electrostatic effects and may be propelled simply by suitable manipulation of insulating rods without physical contact between the rods and the balls. This phenomenon has no known application." Yes it has, chums! I've just taken out British Patent Application No. 200/80/200 for new Fun-Fair miniature billiard tables. Send lowest quotations for extruded cues to

DOGSBODDY.

***More Fun in the Fun Fair***

# Polypropylene

*In this, the first detailed report on the Montecatini polypropylene polymer "Moplen" emphasis is placed on the material's properties, methods of fabrication and actual and potential applications. This evaluation has been prepared for "Plastics" by the company's technical service and research department in Milan.*

THE reader requires little reminding that one of the most important of developments in the chemistry of polymers has been launched as a result of the work of Professor Guilio Natta at the Polytechnic Institute of Milan. It was there that he discovered the " stereospecific " methods for polymerizing alpha- and di-olefins by means of co-ordinated anionic catalysis and also the " isotactic " structure of the resulting polymers. The technical production of these new types is now being carried out on an increasing scale by the Italian chemical industry—more specifically by Montecatini, Società Generale per l'Industria Mineraria e Chimica.

These discoveries permit the manufacture, using asymmetrical monomeric units, of macromolecules having a perfect regularity of structure. In many cases we see too the production of new types of macromolecular substances not existing in nature, such as the " isotactic," crystalline polymers.

The " stereospecific " polymerization processes yield polymers having molecular weights which can vary at will from tens of thousands to figures of a million, starting from simple asymmetrical monomers such as alpha-olefins and di-olefins; furthermore they give products having regular, linear structure and the required degree of crystallinity, and are thus suitable for very varied applications. More specifically, polymers and copolymers of propylene, a monomer obtainable together with other olefins in high yields and at low cost from petroleum, appear to be destined to great developments in the field of plastics, textile fibres, synthetic rubbers, and of constructional materials. It is to be foreseen that their production costs will be competitive with those of many natural and synthetic products, whose properties should be surpassed, on technical evaluation, by the new types.

Montecatini, the largest of Italian chemical enterprises has extensively developed and tested the industrial possibilities and commercial trends of these new polymers, with the result that in September, 1957, Montecatini was able to put on stream in its Ferrara factory the first industrial plant in the world for the commercial production, by stereospecific polymerization of propylene, of " isotactic " polypropylene, now known under the registered trade mark " Moplen."

### Chemical Nature and Structure

When propylene molecules link with each other during polymerization, the resulting chains may, depending on the polymerization conditions, assume one or the other of the structures shown in the accompanying drawings. Here (supposing the polymeric chain to be stretched on a plane) the dotted lines indicate the bonds with the atoms or groups lying below the plane, while the continuous lines indicate the bonds with atoms or groups lying above the plane.

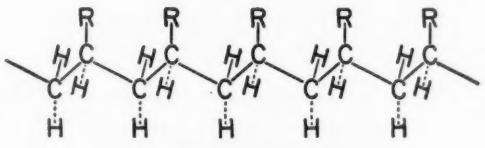


Fig. 1. Isotactic structure.

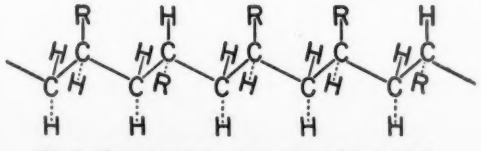


Fig. 2. Disordered structure, termed " atactic."

Using particular " stereospecific " catalysts developed by Professor Natta, a structure of the type shown in Fig. 1, corresponding to the highest intramolecular order and termed " isotactic " namely spatially ordered, can be obtained. On the other hand, when chain formation occurs at random, the product has a final structure which is disordered, and is therefore called " atactic," as shown in Fig. 2.

Depending, therefore, upon the polymerization conditions, different macromolecular structures and, therefore, variations in the characteristics of the polymer, which can be adapted to different technological purposes, may be obtained.

**PROFESSOR GUILIO NATTA**
Professor Natta, whose name is a household word in the field of high polymers, has long been concerned with organic synthesis. Obtaining his Doctorate in Milan in 1924, he returned there in 1938 as Professor of Industrial Chemistry. Since then his researches have covered a remarkably wide field and in particular have resulted in the manufacture, by Montecatini, of polypropylene and isotactic polystyrene. Originating in 1888 as a small copper mine in Tuscany, Montecatini is now the largest mining and chemical combine in Italy.

Particularly interesting products in the field of plastics are obtained in case the polymer has an " isotactic " structure, which is illustrated in Fig. 1.

### Properties of " Moplen "

The polypropylene possesses a unique and excellent combination of physical, mechanical, thermal, electrical and chemical properties which are summarized in Table 4. Among the most interesting properties, the following are worthy of special mention:

**Lightness.** It is the lightest plastic material ever produced (S.G. 0.90). This is important because it means more product per unit weight of polypropylene employed in the manufacture of finished articles. Polypropylene articles, and particularly filaments, float on water.

**Mechanical properties.** It possesses higher tensile strength than high density polythenes. It exhibits also a remarkably high compressive strength, a Rockwell hardness of R85 to R95 and good impact strength.

A high elastic modulus imparts to the material a considerable rigidity, and this engenders good dimensional stability in manufactured articles when under stress.

Furthermore, the surface hardness is very high. When one considers the elasticity of the material in conjunction with its surface hardness, an excellent abrasion resistance is a logical corollary.

**Heat resistance.** The most outstanding single property of " isotactic " polypropylene is perhaps its heat resistance. The melting point of the pure " isotactic " polymer is 176° C. (349° F.), while the commercial plastic has a melting point

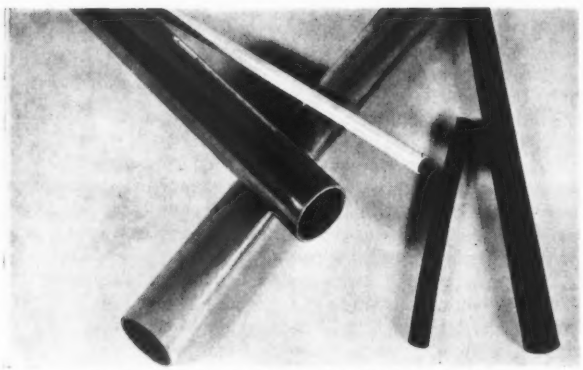


Fig. 3. Example of polypropylene pipes and tubes.

ranging from 164° C. to 170° C. (329° F. to 338° F.) and a Vicat softening point (1 kg. load) higher than 300° F. This renders it one of the most resistant to heat of all thermoplastics. It is now thus possible to get well over the 100° C. barrier for practical service temperatures, for instance in sterilizable containers and in sanitary equipment.

**Electrical insulation.** Polypropylene possesses excellent dielectric properties, even at high frequencies, which make it quite suitable for many applications in the electric, electronic, radio and television fields.

### Types of Polypropylene

Montecatini produces now the following two types:

M/1, having a melt index of about 20, remarkable fluidity in the melted state and therefore particularly suitable for extruded films and blown mouldings.

M/2, having a melt index of about 6, and therefore suitable for injection moulding or for the extrusions of pipes and shapes.

It is expected that Montecatini will be able to offer other types of " Moplen " in due course. Their different molecular weight, crystallinity and technological characteristics will enable them to fulfil the widest possible requirements of the market.

### Processing for Plastic Uses

The technology and equipment for the processing of the material are those commonly used for other thermoplastic materials. Particularly suitable are the injection moulding and extrusion methods, in all their known modifications. Semi-finished and manufactured articles can be easily treated by conventional mechanical processes.

### Injection Moulding

The high fluidity of " Moplen " permits moulding of thin-walled or complex shaped items. The best results can be obtained when using injection moulding machines similar to those used, for example, with polystyrene and nylon, having nozzles of rather large diameter (up to 10 mm.).

**Temperatures.** Cylinder temperature should be maintained between 200° C. and 260° C. (392° F. to 500° F.), depending on the form and weight of the moulded piece. The temperature at the nozzle should be kept at about 30° C. (86° F.) less than that in the cylinder.

**Pressure.** Pressures may range from 700–1,200 kg.–cm.$^2$ (10,000–17,000 p.s.i.). In certain cases it is advisable to use pressures higher than 1,200 kg.–cm$^2$.

**Cycle Times.** These may be very short, as in the case of polythene, using high injection speeds.

**Mould Temperature.** It is particularly recommended that the mould be run at about 80° C. (176° F.). When using carefully chromium-plated moulds, very smooth and brilliant surfaces are obtained.

**Linear Shrinkage.** Linear shrinkage does not exceed 3%; in many cases it may be reduced to 1%. The normal rules are to be followed when establishing mould sizes.

**Warping.** This can be avoided (within certain limits, as regards large sized mouldings) by leaving the moulded piece, after injection, in the mould for a suitable period of time, so as to ensure its complete solidification.

**Colouring.** All colours and shades are available. It is now marketed by Montecatini in granular form, in several brilliant colours.

**Protection Against Light Ageing and Oxidation.** Like polythene, the addition of carbon black, uniformly dispersed, or similar opacifying agents, is useful in order to obtain the desired permanent resistance to attack by sunlight. Normal stabilizers are sufficient for protection against oxidation during fabrication. " Moplen " is not affected by diffused light.

### Extrusion

Extrusion is easily carried out by means of the conventional equipment employed, e.g. for the extrusion of polythene (screw having 4 : 1 compression ratio and length equal to 18–20 times its diameter). As with polythene, care should be taken to follow the normal working methods to obtain uniformity of temperature in the barrel and good performance of the cooling and haul-off systems.

Among the various items which can be obtained by the extrusion method, particularly interesting are pipes, films and sheets.

**Pipes.** The temperatures generally employed for pipe extrusion are:

Barrel, 175° C. (374° F.).
Nozzle, 190° C. to 200° C. (374° F. to 392° F.).

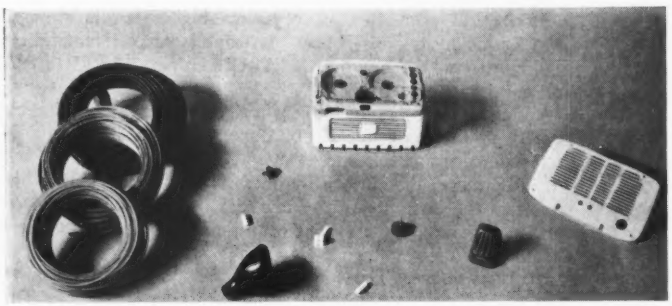
Pipes are, of course, of great importance in the chemical field, when corrosion problems have to be faced. In Fig. 3 several samples of pipes of various sizes, made out of " Moplen," are shown. These pipes have been satisfactorily tested under severe conditions with various fluids at different temperatures.

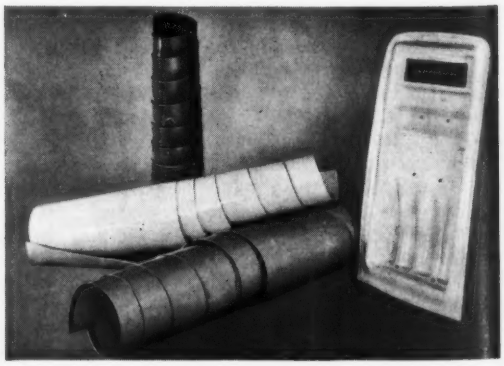
**Films.** Films can be usually obtained from thermoplastic materials both by blowing and flat die processes.

The approximate temperatures are:

| | *Flat Die* | *Blowing* |
|---|---|---|
| Barrel .. | 180° C. (356° F.) | 170° C. (338° F.) |
| Nozzle .. | 220° C. (428° F.) | 200° C. (392° F.) |

The gloss and transparency of " Moplen " flat die films are





(Above) Fig. 4. Electrical mouldings. (Right) Fig. 5. Vacuum-forming sheets and a refrigerator moulding.

much superior to those shown by polythene and other plastic materials if fast cooling is employed.

**Heat Sealing.** Films may be heat-sealed with the same equipment as used for the welding of polythene films. Owing to the very low dissipation factor of the material, high frequency equipment cannot be used.

In Table 1 some mechanical properties of films made out of "Moplen" are compared with those of other widely used thermoplastic films and the importance of "Moplen" for packaging applications are clearly seen.

TABLE I

MECHANICAL PROPERTIES OF "MOPLEN" AND OTHER PLASTIC FILMS

| Properties | Test Method | Units | "Moplen" | Polythene high pressure | Cellulose |
|---|---|---|---|---|---|
| Tensile strength— | | | | | |
| Lengthwise ... | ASTM D882-54T | kg./cm.$^2$ | 350–400 | 190–200 | 300–1,300 |
| Transversal ... | | | 280–330 | 180–190 | |
| Elongation— | | | | | |
| Lengthwise ... | ASTM D882-54T | % | 600–700 | 270–290 | 14–15 |
| Transversal ... | | | 650–750 | 220–240 | |
| Tear resistance— | | | | | |
| Lengthwise ... | ASTM D1004-49T | kg./cm. | 170–180 | 85–90 | 20–90 |
| Transversal ... | | | 150–160 | 70–80 | |
| Linear dimension changes— | | | | | |
| Lengthwise ... | ASTM D1204-54 | % | none | −6 | −0.7; |
| Transversal ... | (100° C.–30') | | none | +2 | −4.2 |

The extrusion technique is also useful for obtaining the following other articles:

**Wire Covering.** In covering wire "Moplen" exhibits excellent properties, both electrical and mechanical, as well as high resistance to cracking. No difficulty has been found in the covering process, but care should be taken to ensure that the product, immediately after extrusion, is cooled uniformly and progressively. In Fig. 4 electric wire covered with the material is shown.

**Sheets.** Polypropylene can be extruded in sheets of any thickness and colour which, in turn, are suitable for other fabrication methods such as vacuum forming (Fig. 5).

**Paper, Cloth and Aluminium Coating.** A flat die should be used from which the hot extruded film is immediately laid on the substrate (paper, cloth or aluminium sheet) using two rollers, one of rubber, the other of steel.

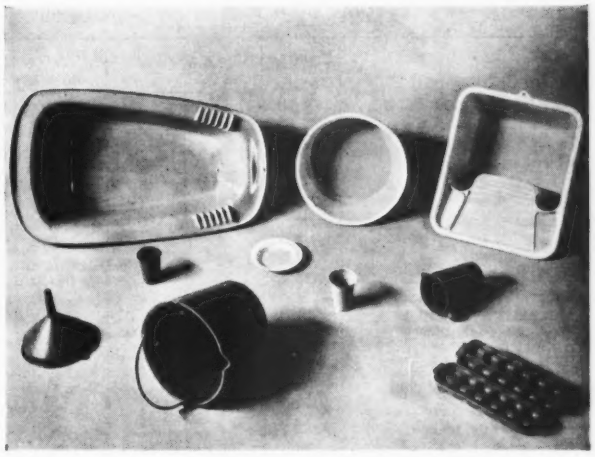


Fig. 7. Typical examples of mouldings for domestic appliances, from a baby's bath to a beaker.

**Filaments.** Can also be obtained with "Moplen" by the conventional method for this process (extrusion and hot drawing). The tensile strength, after drawing, may equal that of the best synthetic fibres.

**Blown Containers.** These are produced by the same method as for the blowing of polythene (extrusion of a pipe which, still hot, is blocked into a mould where the desired form is obtained by blowing into it). Temperatures: Barrel, 175° C. to 185° C. (347° F. to 365° F.). Nozzle, 210° C. to 230° C. (410° F. to 446° F.).

**Air Injection.** The air need not be heated, but the pressure should be increased progressively.

**Heat Degradation.** In order to avoid the effects of prolonged heating above 200° C. (392° F.), the following general working instructions should always be observed:

(1) During both the extrusion and the injection moulding, never exceed a given temperature limit. This varies, depending on the particular equipment and the speed of extrusion, but is usually of the order of about 270° C. (518° F.).

(2) At the end of each working period the machine should be cleaned. If material remains in the cylinder, it may decompose and lead to various difficulties.

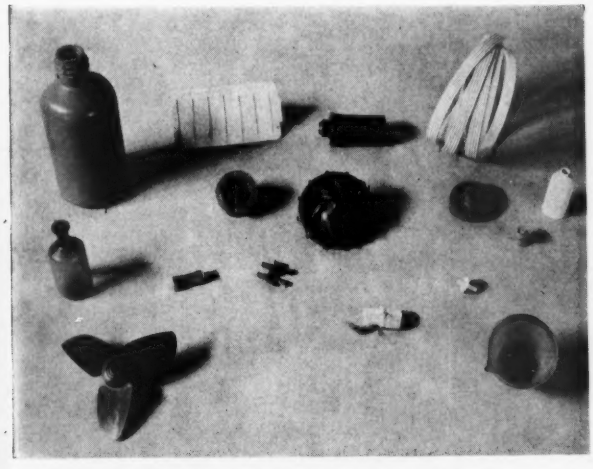


Fig. 6. Examples of technical mouldings in "Moplen."

Fig. 8. A further range of domestic articles.

TABLE 2

| Reagents | Test Days | Temperature | | Weight Increase | Tensile Strength* | | Total Elongation % * | Notes |
|---|---|---|---|---|---|---|---|---|
| | | ° C. | ° F. | | kg./sq. cm. | lb./sq. in. | | |
| Control ... ... ... ... | — | 20 | 68 | — | 300 | 4,300 | 440 | — |
| Sulphuric acid 80% ... ... | 30 | 20 | 68 | Negligible | 293 | 4,160 | 480 | Slight colouring |
| Sulphuric acid 80% ... ... | 7 | 70 | 158 | Negligible | 330 | 4,680 | 400 | Slight colouring |
| Sulphuric acid 80% ... ... | 7 | 90 | 194 | Negligible | 329 | 4,670 | 410 | Slight colouring |
| Sulphuric acid 98% ... ... | 30 | 20 | 68 | Negligible | 290 | 4,115 | 230 | Slight colouring |
| Sulphuric acid 98% ... ... | 7 | 70 | 158 | Negligible | 330 | 4,680 | 270 | The liquid becomes dark brown |
| Sulphuric acid 98% ... ... | 7 | 90 | 194 | 0.3 | 335 | 4,750 | 30 | The liquid becomes dark brown and specimen crazes |
| Nitric acid 50% ... ... ... | 30 | 20 | 68 | Negligible | 280 | 3,970 | 335 | — |
| Nitric acid 50% ... ... ... | 7 | 70 | 158 | 0.1 | 360 | 5,110 | 20 | The liquid becomes yellow and specimen crazes |
| Nitric acid 50% ... ... ... | 7 | 90 | 194 | 3.2 | 120 | 1,700 | — | Specimen becomes brittle |
| Nitric acid 94% ... ... ... | 30 | 20 | 68 | 0.2 | 288 | 4,090 | 60 | — |
| Nitric acid 94% ... ... ... | 7 | 70 | 158 | 6 | 100 | 1,420 | — | Specimen becomes brittle |
| Hydrochloric acid, concentrated ... | 30 | 20 | 68 | 0.2 | 280 | 3,970 | 350 | — |
| Hydrochloric acid, concentrated ... | 7 | 70 | 158 | 0.3 | 290 | 4,115 | 330 | — |
| Hydrochloric acid, concentrated ... | 7 | 90 | 194 | 0.5 | 320 | 4,540 | 280 | — |
| Hydrochloric acid, concentrated ... | 7 | 110 | 230 | 0.8 | 330 | 4,680 | 270 | — |
| Sodium hydroxide 40% ... ... | 30 | 20 | 68 | Negligible | 330 | 4,680 | 380 | — |
| Sodium hydroxide 40% ... ... | 7 | 70 | 158 | Negligible | 329 | 4,670 | 360 | — |
| Sodium hydroxide 40% ... ... | 7 | 90 | 194 | Negligible | 330 | 4,680 | 350 | — |
| Sodium hydroxide 40% ... ... | 7 | 110 | 230 | Negligible | 336 | 4,770 | 300 | — |

* Tested according to ASTM D638-52T.

## Other Processes

**Fusion and Centrifugal Casting.** This is a method applied to get large diameter piping: in this case " Moplen " in powder form is the most suitable and has to be used melted in a rotating tube heated at 200° C. to 220° C. (392° F. to 428° F.).

**Metal Surface Coating.** The object to be coated is heated to about 250° C. (482° F.), then dipped into the powder form. Afterwards it is introduced into an oven where the fusion is completed at 250° C.

**Vacuum-forming of Sheets.** This is an excellent technique for large sized pieces (see Fig. 5) or complex shapes and can be carried out using normal machinery, but the sheets should be blocked into the frame after they have already undergone a partial thermal plasticization.

**Welding.** Welding is easily carried out by using a thin rod of polypropylene and an inert gas welding torch which is heated at 200° C. to 220° C. (392° F. to 428° F.). The various methods in use for polythene (butt welding, lap welding, chamfer welding, etc.) can be followed.

**Ink Printing.** The adhesion of ink to the material is good but can be improved by pre-treating the surface with methods used for polythene (particularly by electrostatic discharge).

**Machining and Finishing.** The material is easily worked on conventional machine tools (lathe, milling machine, drilling machine). Comparatively high cutting speeds can be applied.

**Resistance to Chemicals.** The new plastic is resistant both to alkalies and acids, even at high temperatures; it exhibits no environmental cracking when it comes into contact with solvents and polar substances.

In Table 2 (above) some characteristic data is reported.

**Solvents and Adhesives.** There are no solvents for polypropylene at room temperature and under low temperature conditions. It dissolves only in aromatic and chlorinated compounds, at temperatures above 80° C. (176° F.).

The behaviour of the material in conjunction with conventional adhesives is comparable with that of any similar plastic.

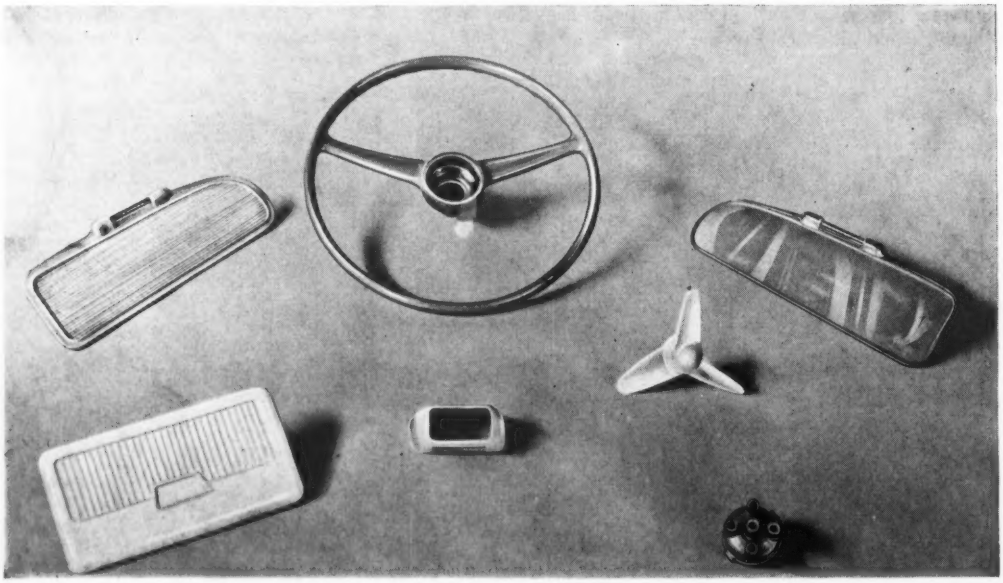


Fig. 9. The motor industry is already very interested in polypropylene, as indicated by this range of mouldings which include both technical and decorative applications.

TABLE 3

| Solvents | Weight Increase | Tensile Strength | | Total Elongation % (*) |
|---|---|---|---|---|
| | | kg.—cm.² | lb./sq. in. | |
| — | — | 300 | 4,300 | 440 |
| Petrol ... ... ... ... | 13.2 | 260 | 3,690 | 700 |
| Benzene ... ... ... | 12.5 | 265 | 3,760 | 690 |
| Carbon tetrachloride ... | 41.3 | 270 | 3,830 | 720 |
| Acetone ... ... ... | 2.0 | 260 | 3,690 | 600 |

* According to ASTM—D638–52T.

In Table 3 some significant data are reported, showing the physical properties of " Moplen " after a 30 days immersion test at 20° C. (68° F.) in several solvents.

**Permeability to Gases and Vapours.** Permeability to common gases and vapours is considerably lower (25% to 50%) than that of high pressure polythene. The same applies to the diffusion of liquids.

**Applications.** Products made from " Moplen " can be used in fields where conventional thermoplastic materials fail or are, for some reason, not completely satisfactory. The material thus offers a whole new range of performance for articles commonly designed for thermoplastic production. At the same time, it makes many new thermoplastic applications possible.

The range of these new applications is so wide that it cannot yet be, even approximately, defined.

Among the possibilities already tested, a few are the following: Pipes (see Fig. 3) and structural shapes, sheets (see Fig. 5), transparent films, coloured and colourless, cables and wire coverings (see Fig. 4), electrical, electronic, radio and television equipment (see Fig. 4), containers, bottles, flasks, beakers, basins, tubs (see Figs. 6, 7 and 8), chemical equipment (see Fig. 6), equipment for the textile and dyeing industries (see Fig. 6), household articles (see Figs. 7 and 8), electrical domestic appliances, sanitary sterilizable articles, toys, and automotive industry items (see Fig. 9).

The possibility of manufacturing filaments, yarns and staple fibres and their textile applications is also emphasized.

TABLE 4

TYPICAL PHYSICAL PROPERTIES OF " MOPLEN "

| Properties | Test Method | Units | Type M/1 | Type M/2 |
|---|---|---|---|---|
| PHYSICAL AND MECHANICAL— | | | | |
| Specific gravity ... ... ... ... ... ... | ASTM D792–50 | kg./litre | 0.90–0.91 | 0.90–0.91 |
| Apparent density (granular form) ... ... ... | ASTM D392–38 | kg./litre | 0.40 | 0.40 |
| Bulk factor ... ... ... ... ... ... ... | ASTM D1182–54 | — | 2.25 | 2.25 |
| Molecular Weight (average) ... ... ... ... | — | — | 80.000 | 150.000 |
| Intrinsic viscosity ... ... ... ... ... ... | — | $10^2$ cm.²/g. | 1.5–2 | 2.5–3 |
| Yield strength ... ... ... ... ... ... | ASTM D638-52T | kg./cm.² | 300–350 | 300–350 |
| | | lb./in.² | 4,300–5,000 | 4,300–5,000 |
| Ultimate tensile strength (2 in./min.) ... ... ... | ASTM D638–52T | kg./cm.² | 300–350 | 320–380 |
| | | lb./in.² | 4,300–5,000 | 4,600–5,400 |
| Elongation (yield point) ... ... ... ... ... | ASTM D638–52T | % | 10–20 | 10–20 |
| Total Elongation ... ... ... ... ... ... | ASTM D638–52T | % | 500–700 | 500–700 |
| Compressive strength ... ... ... ... ... | ASTM D695–54 | kg./cm.² | 666–766 | 600–700 |
| | | lb./in.² | 9,500–11,000 | 8,500–10.000 |
| Stiffness (flexural) ... ... ... ... ... ... | ASTM D747–50 | kg./cm.² | 9,000–12,000 | 8,500–10.000 |
| | | lb./in.² | 130,000–170,000 | 114,000–143,000 |
| Hardness, Rockwell ... ... ... ... ... | ASTM D785–51 | R-scale | 90–95 | 85–90 |
| Impact strength, Izod test, ½ in. x ½ in. unnotched bar | ASTM D296–54T | kg./cm./cm.² | 80 | 80 |
| | | ft./lb./in. | 19 | 19 |
| Young's modulus ... ... ... ... ... ... | Ultrasonic | dyn./cm.² | $3.0–3.3 \times 10^{10}$ | $3.0–3.3 \times 10^{10}$ |
| Water absorption ... ... ... ... ... ... | ASTM D570–54T | % weight increase | Nil | Nil |
| ELECTRICAL— | | | | |
| Dielectric constant ($10^6$ cycles/sec.) ... ... ... | ASTM D150–54T | — | 2.0–2.1 | 2.0–2.1 |
| Dissipation factor ($10^6$ cycles/sec.) ... ... ... | ASTM D150–54T | — | 0.0002–0.0003 | 0.0002–0.0003 |
| Dielectric strength ... ... ... ... ... ... | ASTM D149–55T | kV./mm. | 30–32 | 30–32 |
| | | V./mil. | 75/80 | 75/80 |
| Volume resistivity ... ... ... ... ... ... | ASTM D257–54T | Ohm.cm. | $>10^{16}$ | $>10^{16}$ |
| THERMAL— | | | | |
| Melt index* ... ... ... ... ... ... ... | ASTM D1238–52T | g./10 min. | 20 | 6 |
| Thermal conductivity ... ... ... ... ... | — | k. cal./cm./cm.²/sec./° C. | $3.3 \times 10^{-7}$ | $3.3 \times 10^{-7}$ |
| | | B.T.U./in./ft.²/hr./° F. | 0.95 | 0.95 |
| Specific heat (from 20° C. to 60° C.) ... ... ... | — | k. cal./g./° C. | 0.46 | 0.46 |
| Coefficient of thermal expansion ... ... ... ... | ASTM D696–44 | cm./cm./° C. | $110 \times 10^{-6}$ | $110 \times 10^{-6}$ |
| | | in./in./° F. | $61 \times 10^{-6}$ | $61 \times 10^{-6}$ |
| Mould shrinkage ... ... ... ... ... ... | ASTM D955–51 | % at room temp. | 3 | 3 |
| Brittleness temperature ... ... ... ... ... | ASTM D746–55T | ° C. | < − 10 | < − 10 |
| | | ° F. | < 14 | < 14 |
| Deformation under load† ... ... ... ... ... | — | % | < 10 at 135° C. | < 10 at 135° C. |
| Softening point (Vicat—1 kg.) ... ... ... ... | DIN 57302 | ° C. | > 140 | > 140 |
| | | ° F. | > 284 | > 284 |
| Softening point (Vicat—5 kg.) ... ... ... ... | DIN 57302 | ° C. | > 85 | > 85 |
| | | ° F. | > 185 | > 185 |
| First order transition temperature ... ... ... | Crystallographic microscope | ° C. | 164–170 | 164–170 |
| | | ° F. | 329–338 | 329–338 |
| Second order transition temperature ... ... ... | Specific volume test | ° C. | − 35 | − 35 |
| | | ° F. | − 31 | − 31 |
| Resistance to heat when not subject to strain ... ... | — | ° C. | 150 | 150 |
| | | ° F. | 302 | 302 |

* Method modified by using 10 kg. load instead of 2.16 kg.

† Under tension of 15 kg./cm.² (210 lbs./in.²) by increasing temperature at the rate of 50° C./hr. (90° F./hr.)

# Plastics Production and Exports, 1957

*The twelve months ending December last marked a record year for the British plastics industry. Output of plastics materials exceeded 400,000 tons, of which nearly a quarter was exported to the value of £29,000,000. The following brief announcement has just been released by the British Plastics Federation. We also publish on this page the bulletin on production in the U.S.A., issued by the Society of the Plastics Industry, Inc.*

## U.K. PLASTICS EXPORT RECORD

EXPORTS of plastics raw materials from the United Kingdom set up a new record in 1957. More than 111,800 tons were exported, valued at £29,000,000, representing increases of nearly 14,000 tons and £3¾m. over the record levels of 1956. The tonnage represents an increase of more than 50% in three years (1954 total, 73,000 tons, valued at £20½m.).

In 1957, Australia was again the biggest buyer, with imports valued at over £4m. (against £2¾m. 1956) and exports to France increased from £1.6m. to over £2m. The third largest buyer was India (£1.6m.) while for New Zealand, the Netherlands, Sweden, and South Africa, the values were all over £1.5m.

The exported materials consist of moulding powders, resins, sheet, rod, tube, film and foil, but do not include finished products or components, large amounts of which are used in such industries as aircraft, electrical and radio, and motor manufacture, nor do they include plastics machinery.

* * *

## U.S.A. PRODUCTION INCREASED

A SEVEN PER CENT. gain in the plastics industry occurred last year as the production of plastics and resins materials reached another new high or approximately 1,960,000 tons, including cellulosics, The Society of the Plastics Industry, Inc., estimated. This new record was made in spite of the fact that each of the last six years also has been a record one. It compares with the previous year's actual figure of 1,841,270 tons including cellulosics.

For the second year in a row the plastics industry was in the two billion dollar class as the dollar value of its products reached approximately $2,100,000,000 as compared with $2,050,000,000 in 1956.

A breakdown of last year's production figures for plastics and resins for some of the principal materials is estimated as follows:

| *Materials* | *Tons* | *Per cent. of Change* |
|---|---|---|
| Polyesters .. .. .. | 42,300 | up 30.7 |
| Cellulosics .. .. .. | 67,400 | up 3.5 |
| Polystyrene .. .. .. | 283,700 | up 1.1 |
| Polythene .. .. .. | 304,800 | up 22.6 |
| Vinyls .. .. .. .. | 375,400 | up 11.8 |
| Urea and Melamines .. | 137,700 | down 2.8 |
| Phenolics and other Tar Acid Resins .. .. .. | 212,000 | down 7.1 |

The total dollar sales picture for moulders and extruders did not keep pace with the poundage growth for output in this important segment of the industry based on monthly sales statistics compiled by the Society. It is felt that this was due in part to keen competition resulting in lower prices.

The SPI mould sales statistics, generally regarded as an indication of the future trend of new business, continued to run a little higher than the year before. New mould sales were up 2½% in 1957. However, this contrasted with a 16% increase in 1956 over 1955.

In regard to general business conditions in the plastics field, SPI conducted a survey among its 950 member companies in the United States. 32% of the companies filled in and returned the questionnaires and an analysis of the answers concerning the first six months of 1958 compared with the answers received last year applying to the same period of 1957, is as follows:

THE FIRST SIX MONTHS OF 1958 v. 1957

| | *Higher* | | *About same* | | *Lower* | |
|---|---|---|---|---|---|---|
| | *1958** | *1957†* | *1958** | *1957†* | *1958** | *1957†* |
| 1. Sales: | 153 | 160 | 106 | 64 | 45 | 10 |
| 2. Profits: | 101 | 108 | 114 | 88 | 89 | 36 |
| 3. Size of Work Force: | 80 | 114 | 173 | 115 | 47 | 5 |
| 4. Wage Rates: | 156 | 147 | 144 | 83 | None | None |
| 5. Your Prices: | 52 | 64 | 204 | 155 | 46 | 15 |
| 6. Your Material Costs: | 69 | 82 | 200 | 138 | 26 | 12 |
| | *Good* | | *Slow* | | | |
| | *1958** | *1957†* | *1958** | *1957†* | | |
| 7. Your Collections Now: | 231 | 188 | 68 | 44 | | |
| | *Adequate* | | *Inadequate* | | | |
| | *1958** | *1957†* | *1958** | *1957†* | | |
| 8. Your Working Capital: | 240 | 194 | 56 | 38 | | |
| | *Yes* | | *No* | | | |
| | *1958** | *1957†* | *1958** | *1957†* | | |
| 9. Do you Plan to Expand? | 145 | 152 | 147 | 77 | | |

*Based on replies from 306 companies.
†Based on replies from 235 companies.

While only 50% of the companies replying indicated that they planned any expansion at all, the extent of this planned expansion ranged from 5% to 600%. However, most of the companies planning to expand more than 10% were smaller companies.

All types of thermoplastic pipe produced on a proprietary as well as a custom basis, reached a total of approximately 26,000 tons last year, compared with about 24,500 tons in 1956. Produced from polythene, cellulose acetate butyrate, polyvinyl chloride and styrene base formulations, thermoplastic pipe is expected to reach 27,000 tons in the current year.

Cellular plastics, also known as foamed plastics, produced from basic resins such as vinyl, urethane and polystyrene, exceeded 13,000 tons in 1957 which was approximately a 100% increase over the 7,100 tons produced the previous year.

One of the outstanding developments in the plastics industry during 1957 was the availability of high density polythene, a new olefin plastic with superior properties that promises to open many new markets to plastics. Late in 1957 a second member of the olefin family, polypropylene, made its appearance in the European market, and in December one American chemical firm went on-stream with a commercial plant for its production.

The squeeze on profits in the plastics field may be expected to intensify further. Certain branches of the industry particularly those in their early growth stages should forge volume-wise, but it is doubtful if this will offset declines elsewhere during the early months of the new year.

We would expect that defence spending rising by some $2 billion by the second half of 1958 along with easier money rates may be the start of a renewed upturn for plastics.

Based upon the overall business picture as well as the plastics industry's expansion plans, it looks like a 1 or 2% overall increase in plastics output this year.

## Recent Advances in Polymer Technology

A large number of applications has been received for the above Conference to be held at the Institution of Civil Engineers on Thursday, February 27, 1958. (For programme see January issue of *Plastics*, page 36.) As accommodation is limited all those wishing to attend should submit their registration forms without delay to the Plastics Institute, 6 Mandeville Place, London, W.1.

# International Boat Show, 1958

*More photographs taken at the Show will be found in the "Plastics in the Service of Man" feature, pages 48–50*

THE 1958 Boat Show marked the biggest step forward the plastics industry has made in the marine field to date. Not merely had the number of plastics applications increased—the quality overall was measurably superior to that of previous shows and the interest in plastics, both by builder and buyer alike, was substantially greater.

In tonnage, the most important plastics application was that of polyester-glass in hulls. Leading the field were W. & J. Tod Ltd., Ferrybridge, Weymouth, the Samuel White Group, 3/8 Duncannon Street, London, W.C.2, Halmatic Ltd., Portsmouth, Hampshire, Maximar Mouldings Ltd., Pulborough, Sussex, Willerby Plastics, Willerby, near Hull, F. Hutchings & Son, exhibiting on the stand of Glass Yarns & Deeside Fabrics Ltd., Ceacraft, Shirley, Solihull, Warwickshire, Wright & Sons, Ltd., Ipswich, Suffolk, and Boats & Engines, Kingston-upon-Thames, Surrey.

Of particular interest was the 18-foot lifeboat and workboat designed for use by trawlers and containing built-in buoyancy sandwiched between polyester-glass skins, constructed by Samuel White. This boat has been classified by the Ministry of Transport as a Class C vessel and although its cost is considerably higher than a conventional craft, it has a tremendous safety factor. Long-line fishermen from Cornwall and the Scilly Isles were most interested in this craft in view of the dangerous waters in which they work. White's also showed a 13-foot runabout priced at £282 ex engine, and a 16-foot sailing dinghy with built-in buoyancy, built to Admiralty specifications, and costing £366 including full gear and sails. The bare hull weighed only 110 lb. The 26-foot ships' lifeboat shown by White's was fitted with loose buoyancy tanks.

Tod's showed several craft, including an interesting 20-foot two-berth cruiser with a speed of 30 knots. Also on display were a 9-foot sailing dinghy, priced at £103, a 7 ft. 6 in. tender, a 15-foot runabout with p.v.c. upholstery, and a 12-foot Bermudan rigged dinghy priced at £170. Tod's employ Filabond polyester resin manufactured by Beck Koller & Co., Ltd.

Maximar had several craft on show, including a racing yacht. Glass reinforcements used include those of Fibreglass Ltd., Glass Yarns & Deeside Fabrics Ltd., and Turner Brothers Asbestos Co., Ltd. Self-coloured hulls are made with Reeves pigments, who had a stand at the show, and polyester resins of Mitchell & Smith Ltd., and B.I.P. Chemicals are employed. The latter company had a large stand.

Halmatic showed a beautifully finished cruiser hull and two other craft, and also displayed on the stand a panel of McMurdo Aqualites, safety devices for rescue at sea, described in the April, 1953, issue of *Plastics*. The range has now been greatly extended.

Moulding with polyester and glass fibres was demonstrated on both the "Boating-on-a-budget" and the "Build-it-yourself" stands. Kits are made by the Glass Moulding & Design Co., Bridge Road, Camberley, Surrey.

On the stand of Graham Bunn (Wroxham) Ltd. was a remarkable craft, the 15-foot "Dusky Queen." This boat, built of plywood and designed to the specifications of the American Outboard Association, was sheathed entirely in cellulose acetate. Bunn's have the selling agency for the U.K. for this sheet, under its trade name Siflex, and we understand it is of Italian origin. Available in a wide range of colours, the sheet is softened in a mixture of acetone and water, when it becomes soft and pliable, and is then spread over the prepared wooden surface where it dries hard and tight. The "Dusky Queen" has been extensively tested for the strength and abrasion resistance of the plastic sheathing which has proved most successful. The cost of application is between 10s. 6d. and 12s. 6d. a square foot. Vynide p.v.c. upholstery was used in the upholstery of the seating. The technique of sheathing with acetate may mark an important development in the use of plastics in the boat industry.

Both in upholstery and decking, p.v.c. showed a substantial gain in application. In the latter case, boat builders commented very favourably upon its wear resistant and non-slip properties.

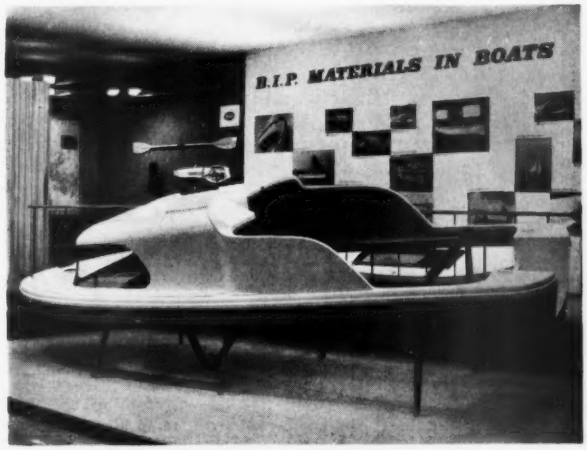
Terylene was seen not only for sails but also as the fabric for a new inflatable three-man craft weighing only 15 lb. It has been developed for use as a yacht tender, life raft, or as a family boat, by Beaufort (Air-Sea) Equipment Ltd., of Birkenhead, Cheshire. The Terylene fabric has been proofed with Neoprene.

B.I.P. Chemicals Ltd. used their stand to illustrate the use of Beetle polyester resins in boat building, and to show too the use of Beetle adhesives marketed in Britain by the Barter Trading Corporation Ltd., and Melmex powder used in the production of tableware.

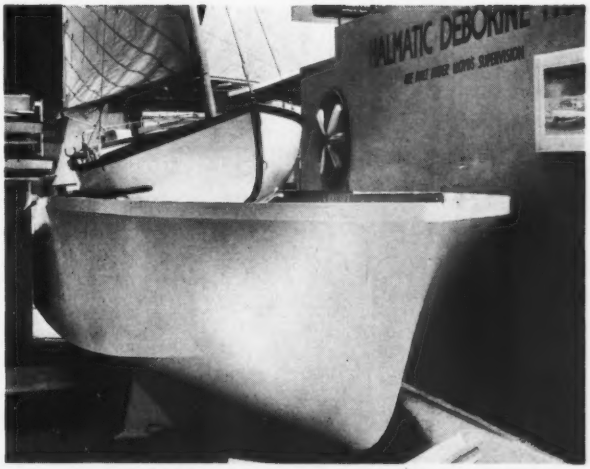
Aero Research Ltd. showed examples of the use of Aerolite resin glues in boat building, and Araldite epoxy adhesives for bonding metal, glass, and other non-porous materials.

In addition to the photographs on this page, the complete "Plastics in the Service of Man" feature for this issue has been devoted to plastics applications at the Boat Show, and will be found on the three following pages.

Essex Canoes showed this craft the frame of which is covered in p.v.c.



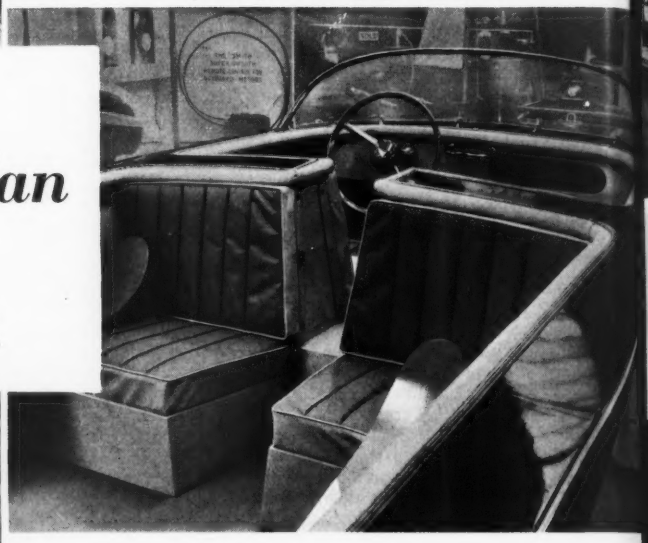

Superstructure of cruiser shown by B.I.P. Chemicals Ltd.




Hull for cruiser shown by Halmatic.

(Left) The Bunn Dusky Queen whose hull is sheathed in cellulose acetate.

(Below) The interior of the Dusky Queen showing the p.v.c. upholstery and the high gloss on the hull.



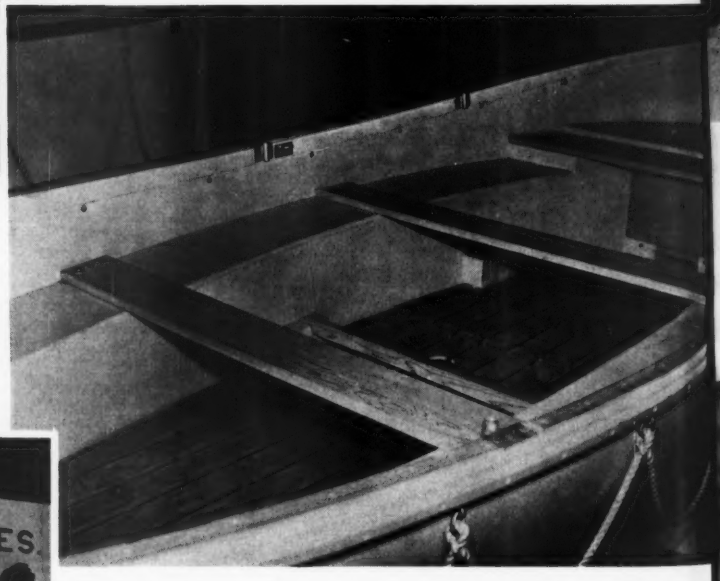
# *Plastics in the Service of Man*

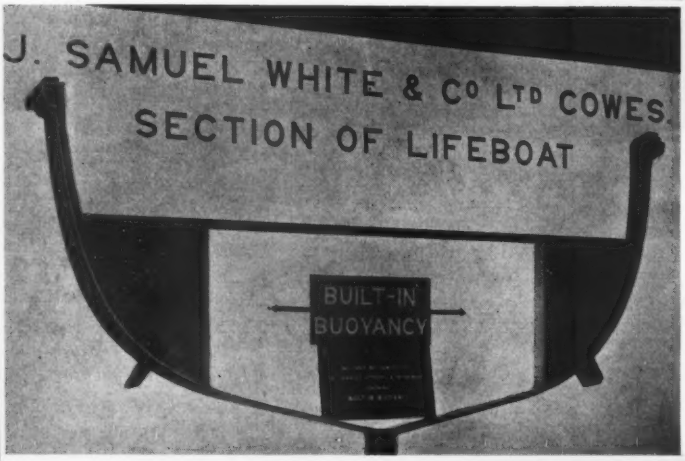
## 75 Plastics at the Boat Show

*A list of trade names and companies mentioned in this review, with full names and addresses appears on page 67*

(Above) Glass fibre/polyester trawler boat shown by J. Samuel White & Co. Ltd.

(Below) Interior of trawler lifeboat showing the built-in buoyancy compartments.






(Left) Midship section of the boat which gives some idea of the size of buoyancy compartments. It should be noted that the buoyancy compartment extends between the double skin up to the gunwale.

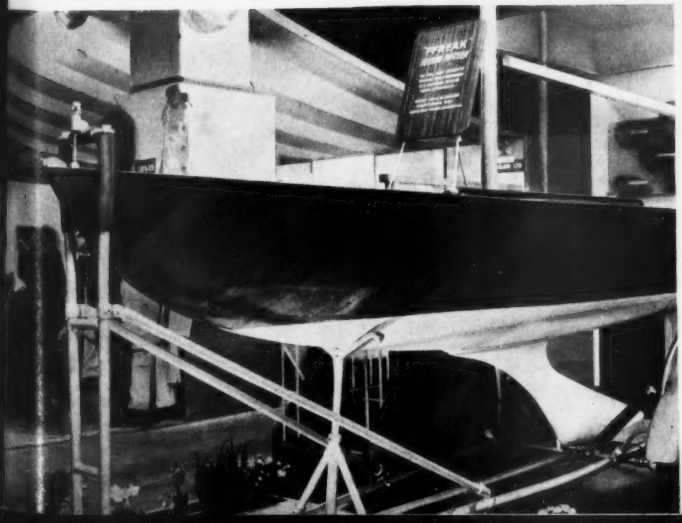
(Left) Tod twin screw high-speed cabin cruiser constructed from two glass fibre/polyester mouldings.

(Above) 7 ft. glass fibre/polyester ocean dinghy with built-in foamed polystyrene buoyancy shown by Wright & Sons (Ipswich) Ltd.

(Below) The Tod 9 ft. lugsail plastics dinghy.

(Below) The 16 ft. 6 in. sailing dinghy shown by J. Samuel White.

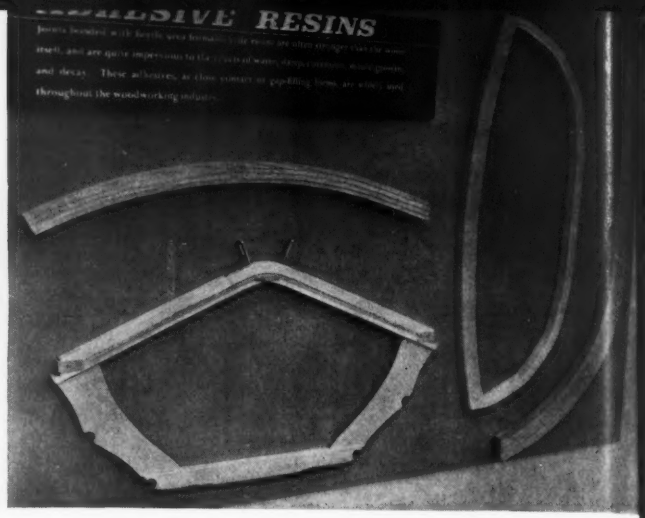
(Right) Speedboat shown by Willerby Plastics.



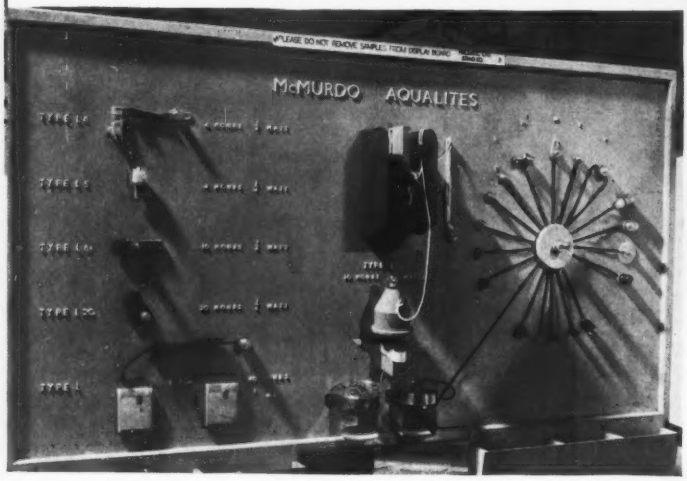
(Above) Zircon dinghy which was of ¼ in. foamed p.v.c./polyester glass sandwich construction. Manufactured by G. Hunter (London) Ltd.

(Left) Flying Fifteen hull constructed from Tufnol laminate.

(Right) Examples of the use of u/f resin glues shown by B.I.P. Chemicals Ltd.

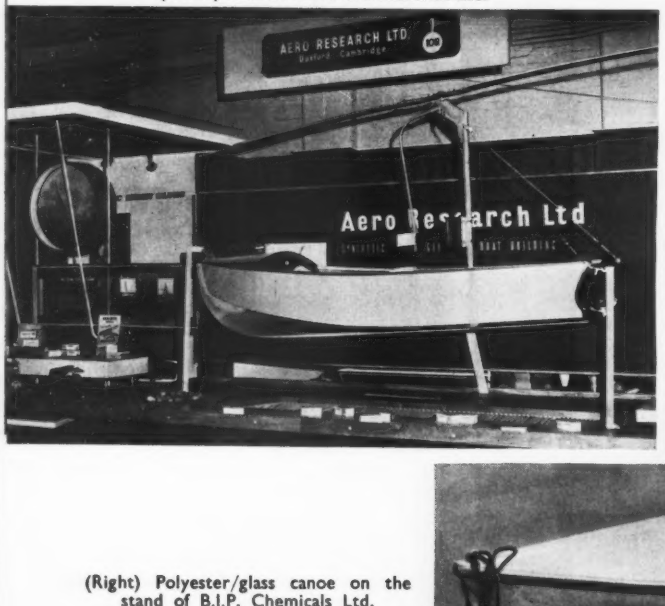



(Below) McMurdo safety equipment shown by Halmatic Ltd.

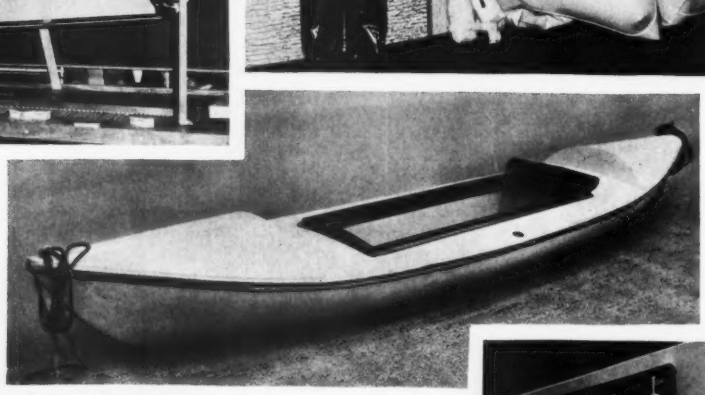



(Below) Welded p.v.c. life-saving equipment and protective clothing shown by R.F.D. Co. Ltd.

(Below) The stand of Aero Research Ltd.

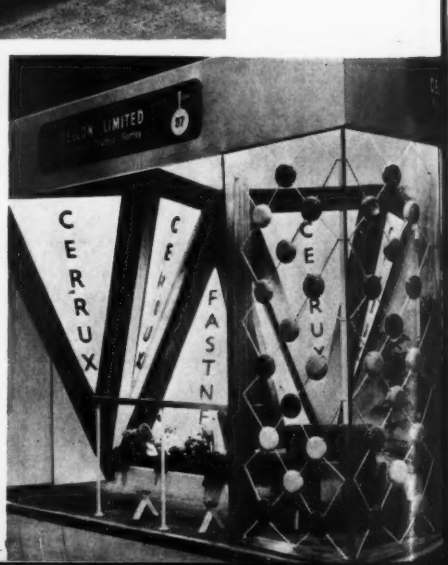



(Right) Polyester/glass canoe on the stand of B.I.P. Chemicals Ltd.



(Left) The stand of Reeves & Sons Ltd., showing their range of pigments.

(Right) Examples of marine finishes shown by Cellon Ltd.



# Reinforced Thermoplastic Sheet

By J. V. EURICH*

*A new material resembling woven fabric embedded in plastic film to confer high strength characteristics*

ELIMINATION of the tearability of polythene film, particularly when used as a packaging, storage or export covering material, forms the main subject matter of the process described in this account of the development of a new type of composite sheet.

Two possible lines of thought have been followed up in this connection; the first one being concerned with the idea of increasing the tensile strength of polythene sheet itself by means of a process related to the Ziegler linear principle. This yielded limited results. The second theory was based on various possible methods of introducing reinforcing threads into the plastic and this work eventually produced a remarkable material which embodies all possible requirements.

THE AUTHOR

*Mr. Eurich, who recently joined Boulton and Paul Ltd., has had a distinguished career in the engineering field. He has been associated with Kodak Ltd., Metropolitan Vickers Ltd., and the English Electric Co. The accompanying article is one of a series to be published in "Plastics" dealing with his work in the technological applications of plastics.*

In appearance the finished product is almost indistinguishable from woven fabric embedded in sheet polythene and in practice it has proved to be immensely strong, being practically untearable yet no loom is used in its manufacture and no actual weaving operation takes place. This material can be heat bonded and/or sewn but needle perforations do not weaken it, the main advantage unquestionably lies in the extremely low cost of production.

When seeking to improve a material which is normally used in such huge quantities, largely for low cost applications, cost of production must of necessity rank as the primary consideration. It is for this reason that the new material as described herein is likely to make a notable impact on many sections of industry and trade because this type of reinforced sheeting can be made at a cheaper price than plain unreinforced sheeting. The reason for this paradox is that the thickness of the sheeting used naturally has to be related to the degree of resistance required to withstand general wear and tear; by introducing reinforcing threads in the manner described herein, it is possible to reduce the gauge of the sheet considerably. The cost of material thus saved amply compensates for the cost of the reinforcing threads including cost of inserting them, so that a more flexible, lighter and much stronger material emerges at a lower cost. Briefly, the invention, which is protected by provisional patents, consists of two layers of threads extending in the same general direction but laid in zigzag formation in between two thin films of polythene in such a manner that adjacent threads of the two sets of threads overlap and cross each other. The two polythene films are bonded to each other at all points of contact in the areas between the threads by the application of heat and pressure.

*Boulton and Paul, Ltd., of Norwich.

## Production

High speed production is achieved by feeding two sheets of polythene in continuous lengths into the nip of a pair of heated, Fluon-coated rollers. Two sets of threads are fed into the same pair of rollers between the two films of polythene.

Immediately prior to entering the nip of the rollers each set of threads passes through its own comb, the teeth of which separate every individual thread so as to hold it in the required position. Quite a simple reciprocating movement induces the combs to toggle rapidly backwards and forwards in a lateral direction in opposition to one another so that the threads are fed into the rollers in zigzag formation one set of threads overlapping the other.

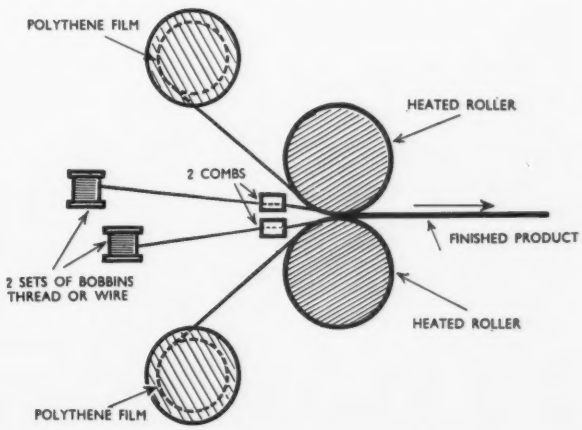
The pair of rollers operates at a temperature sufficiently high to cause homogeneous bonding of the two overlaying films of polythene at all points of contact between the threads so that the emerging laminate is virtually one solid sheet with the threads firmly embedded inside the plastic film. The speed of operation is dependent on the working temperature, and to some degree on the type of heating used, as well as on the size of the drum or roller and on how far the material is allowed to wrap round the roller. Experimental speeds of 12 linear yards per minute have been employed. Perhaps the best guide to possible production speeds is to be found in the maxim that whatever may be the greatest speed at which two films can be heat-bonded by continuous operation that will also be the actual speed of the whole process because the threads can be introduced at an identical speed without any difficulty.

It will be noted therefore that production cost forms only an insignificant portion of the cost of the finished article and it may be said that for all practical purposes the reinforcement is in every respect identical to a woven fabric but the cost of weaving has been eliminated.

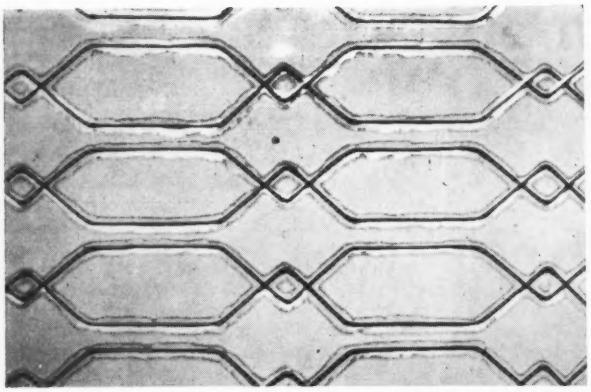
The applications for such a product seem to be virtually limitless. For example, for horticultural apparatus such as cloches, greenhouse lights, etc., for which maximum light penetration is important. It has been found that because such light penetration decreases rapidly in relation to the thickness of the polythene sheet used, a vastly superior article from the point of view of light penetration, resistance to wear and tear as well as cost, can be produced by the employment of thinner gauge polythene film, reinforced with very fine semi-transparent nylon thread so that neither the sheet nor the reinforcement forms an appreciable light barrier.

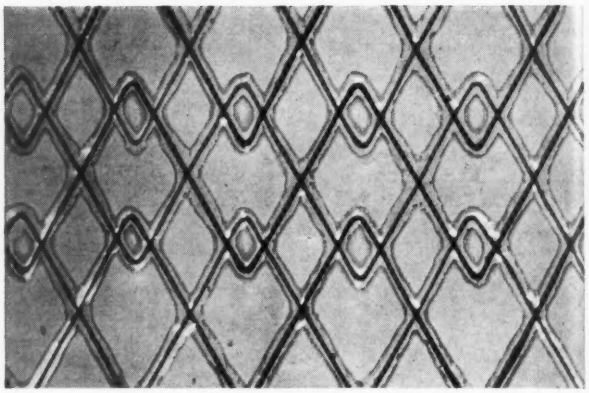
## Synthetic Fibres

Introduction of nylon thread offers no problems because of the considerably higher plasticizing temperature of nylon as against polythene. In addition to the various uses in the way of covering export machinery and other equipment, manufacture of motor car covers and other applications this type of material may well serve many other purposes because of the ease with which threads can be introduced at almost any desired spacing and also because the threads used may consist of any suitable material such as Terylene, linen, cotton, flax, etc. Some delightful multi-coloured effects have been achieved with the aid of nylon reinforcing threads embedded in very thin polythene film, resulting in weave simulation akin to fine lace and suitable for use as tablecloths, curtains, etc. On the other hand very close mesh hemp reinforcement in slightly thicker gauge polythene film produces a




Diagrammatic representation of plant developed by the author for reinforcing plastics films with natural and synthetic fibres.





**(Above and Right) Polythene film is shown here reinforced with cotton and nylon threads. The pattern can be varied at will.**

material akin to woven jute bags of surprising strength and resistance to tearing. It is thought that because of the ease with which this material can be cut, sewn, heat-bonded and mended it may also be suitable for sail cloth manufacture, particularly on account of its low replacement cost and resistance to wind penetration. In this case the reinforcing threads would, of course, be of the polyamide variety.

A completely different kind of article made on the same principle consists of two fairly thick polythene sheets with fine wire reinforcement. In this case the process is very slightly modified in that cold rollers are used and the inner surfaces of the two plastic sheets are preheated so that the outside surfaces do not get heated at all whereas the inner surfaces are caused to plasticize. Wire is embedded between the sheets in an overlapping zigzag formation as already described and the whole becomes one homogeneous sheet with what appears to be a wire netting inlay.

According to another arrangement the threads or wires disposed in one or more layers may be introduced into one single plastic sheet so as to be embedded therein during the actual formation of the sheet, for example, the threads may be introduced into the plastic sheeting as the sheeting is being extruded from an extruding machine whilst the sheeting is still hot and in a plasticized condition.

Up to now the potential of this development has been confined to its application in relation to plastics, and to polythene in particular, because this type of plastic lends itself more readily to homogeneous fusion than, say, p.v.c. or nylon, but apart from this consideration reinforcement of this nature is capable of being applied with equal success to such material as paper and the like.

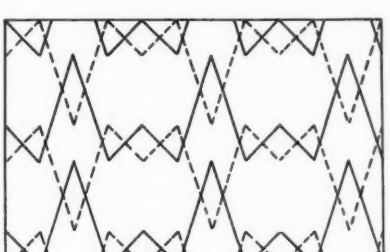
### Roofing Papers

One of the more popular types of roofing papers made for use as a lining under roof tiling is produced by tarring one side of a continuous sheet of strong brown paper and embedding a series of threads longitudinally in the tarred portion, a second length of paper is similarly prepared with a series of threads laid laterally, the two papers being subsequently bonded together face to face with the layers of tar and the crossing threads in between, the whole process comprising fairly costly multiple operations, particularly as lateral thread insertions cannot be carried out as one uninterrupted operation. The method now proposed of zigzagging threads in between two papers in one single operation at the same time as tar is being applied, must of necessity reduce cost of manufacture substantially.

Paper can be reinforced in this manner with all types of threads using a suitable adhesive as a bonding agent and the resulting lamination can be employed for carrier bags, packaging and countless other applications.

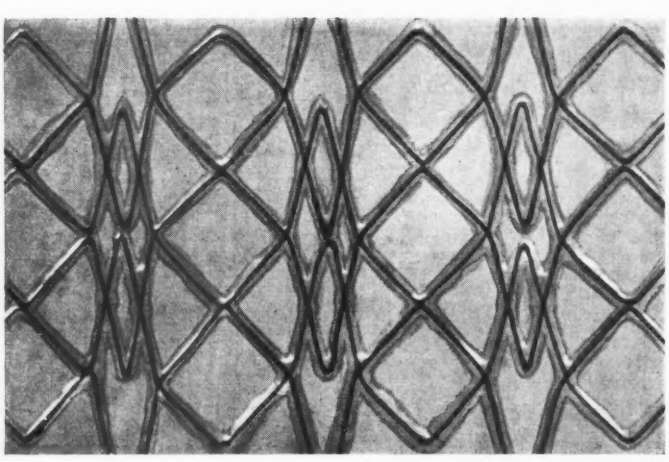
The formation of threads is not necessarily confined to zigzag patterns, in fact all kinds of variable designs have been produced and these have been enhanced by the utilization of colour and variable size and shape of mesh as well as by increasing the number of overlaying sets of thread from two to three or more.

Although this article releases the first public information concerning this process, certain sections of the trade have been aware for some time that experiments were being conducted with this method of reinforcement. The vast potential of the invention has been immediately recognised and investigations into possible applications are now being conducted by several Companies at home and abroad.



**Typical fibre pattern obtainable.**

Purely from the interest point of view it may also be mentioned here that unusual results were achieved with some very interesting experiments when polythene coated thread was used and heat-bonded to itself in the zigzag manner described but without any film backing so that a rather beautiful lace-like material resulted. It was also found possible to embed threads in the manner described in one or both sides of a single plastic film instead of between two films. This later technique is particularly suitable for the production of inexpensive tablecloths because one side has a genuine textile surface showing a weave simulation with the appearance of a fine cotton or linen fabric whereas the backing can be of highly plasticized and therefore very soft · p.v.c. Colour printing of designs and additional embossing can be added subsequently if desired on one or both surfaces. Once again the emphasis is, of course, on the remarkably low cost of manufacture.



**Another example of a complex pattern easily achieved with this process by changing the combs.**

# 9th International Toy Fair

*A brief review of some of the many plastics applications and general impressions obtained from the Fair*

(Left) Polystyrene dolls' tea pot with separate moulded decoration.

THE value of the annual production of toys in this country is approximately £30,000,000, of which £7,000,000 worth are exported. A large percentage of this figure is made up of toys wholly or partially made from plastics materials, so it is obvious that the toy industry is an important customer of the plastics industry.

Last month the 9th International Toy Fair was held at Harrogate where over 300 exhibitors showed the latest and most novel toys for the forthcoming season. Although international in character, over 75% of the toys on show were British made and we have confined our report to these products having concluded that, in plastic toys at least, overseas competition in quality, originality, and design was not severe; price, however, may have been a different story.

In retrospect there are two main impressions which predominate. The first of these is the striking expansion of the use of polythene and consequent reduction in the use of general purpose polystyrene. The change from the one material to the other is, however, by no means universal in that some manufacturers have preferred the high impact styrenes. Broadly speaking, however, polythene holds the field and one manufacturer reported that 85% of his production is now in this material. Polythene has, of course, presented some serious design problems, probably the biggest of which is the difficulty in joining and cementing the material. The simple solvent weld of polystyrene and acetate has had to be replaced by heat sealing or mechanical fixing, both of which are either more skilled or more costly.

The second impression received is of the swing from the hard bodied doll, generally of acetate, to the softer vinyl skinned doll. This swing is not so pronounced as the change-over to polythene mentioned previously but consideration must be given to the increased number of one-piece dolls and animals moulded in this material which, fitted with squeakers, are now so popular. With the introduction of vinyl heads has come the almost standard practice of rooting the hair instead of attaching wigs.

One final comment in this generalization. The disappearance of the " lead " soldier and its reappearance as a p.v.c. or polythene moulding. This, of course, has been going on for some years, but never before has it been so apparent. Many manufacturers are now able to offer over 200 different figures both of men and animals.

### New Mouldings

In a Fair of this size and of this nature, where the majority of goods displayed are new, it would be an impossible task to pick out all the items of interest and enumerate them, even if space permitted. We have, therefore, mentioned a few which in our opinion are of special significance or interest.

Amongst the many polythene toys exhibited were some fine mouldings by **Poplar Playthings Ltd.**, amongst them a medium field gun which fires a polythene shell by means of a cap. This gun was towed by an equally realistic model of a jeep, also in polythene. **Raphael Lipkin** showed a pull-apart model tractor in polythene designed for easy but firm assembly, and **The Mettoy Co., Ltd.**, included in their selection of polythene toys a tank and tank transporter. An aircraft assembly kit in polythene was one of the Tudor Rose toys displayed by **Rosedale Associated Manufacturers Ltd.**

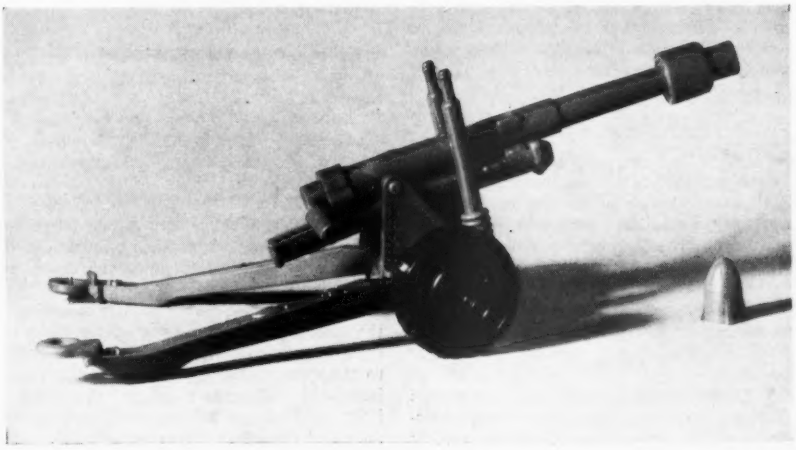
In polystyrene perhaps some of the most attractive toys are the model construction kits ranging from the elaborate scale models of ships like the " Robert E. Lee," the Nantucket Light Vessel and the yacht " Atlantic," moulded by **O. & M. Kleeman Ltd.**, to smaller scale models of vintage cars, aeroplanes, etc., which help to complete the large range moulded by **Airfix Products Ltd.** Polystyrene lends itself to the production of musical toys as was amply illustrated by **Selcol Products Ltd.**, whose Elvis Presley guitar was featured in the December issue of *Plastics*. A moulded dolls' tea pot in polystyrene was of particular interest in that a relieved design in contrasting colour (white) was cemented to the sides of the pot. In this way a very effective and clean appearance was given. The relief design was also injection moulded in polystyrene. The tea pot and tea set were shown by **Leon Cogan.**

Only one company, **Cascelloid,** seems to have made extensive use of vacuum forming. For some years now this company have packed one of their dolls in a vacuum formed Cobex bath complete with sponge, soap, etc., and this year they introduced two speed boats with vacuum formed hulls, one powered by a 75 c.c. engine, the other by a clockwork motor.

**The Chad Valley Co., Ltd.**, used vacuum forming for the manufacture of the water bath in which a new game, blow polo, is played. This company also combined the merits of plastics and metal in a grab crane where the cab was an injection moulding and the jib made of metal.

Welded inflatable toys made from p.v.c. sheet were shown by several companies including **P. B. Cow & Co., Ltd., Servitor Plastic Products and Cascelloid.** The majority of such toys are made from laminated sheet and in this way trouble from pin holes has been eliminated.

Finally mention should be made of a roller skate manufactured by **Davies Steel Specialities Ltd.**, in which the toe and heel caps are injection moulded, the two being linked with a steel channel section. These mouldings are extremely tough, being moulded from imported material manufactured by the **U.S. Rubber Co.**



(Right) Polythene field gun and shell which is fired by the explosive force of a cap.

# World's Industry Employs Plastics

## MATERIALS

### Preparing Dialkyl Phosphites

RECENT interest in organophosphorus compounds has emphasized the potential of dialkyl phosphites, especially as intermediates for preparing insecticides and plasticizers. Commercial development, however, has been retarded by lack of a simple, economical method of preparation.

This process is continuous, requires no solvent, minimizes or eliminates the cooling load, and permits yields of 85 to 95% of theory. It can reasonably be expected to produce lower dialkyl phosphites which sell for 50 cents a pound or less.
(*Ind. Eng. Chem.*, 1957/Nov./1871.)

### Sulphonation of Polyvinyl Aromatics

MANY factors in the high-polymers sulphonation reaction require control when a water-soluble, non-cross-linked, colour-free product is desired: sulphonating agent species, polymer species, molecular weight of polymer, solvent species, concentration of reactants in solution, agitation, purity of solvents and reactants, temperature, molar ratios of reactants, mode of reactant feeding, size of sulphonation vessel, and ageing of finished reaction mixture.

Reducing the concentration of reactants was perhaps of greatest importance in minimizing cross-linking tendencies.

The effect of stepwise increases in cross linking of a non-cross-linked water-soluble sulphonate on its water viscosity and solubility is graphically shown. From a starting viscosity of 1,000 cp. for the water-soluble product, a maximum of 20,000 cp. is attained as a water-swellable product. Further increase in cross linking decreases viscosity trend.
(*Ind. Eng. Chem.*, 1957/Nov./1820.)

### Dewatering of Thermoplastic Resins by Syneresis

A DEWATERING technique has been successfully developed to full scale plant use.

The process is unique, in that up to 80% of the moisture in the filter cake is removed without using evaporative or mechanical methods. This is done by raising the temperature of the wet filter cake of a thermoplastic resin to at least its softening point. Coalescence forces the water to drain off as a liquid. This phenomenon is similar to that known as syneresis in colloidal gel systems.

Data taken from laboratory and plant experience show how dewatering by syneresis was converted into a practical engineering process. A hypothesis is presented to explain the mechanisms of syneresis.
(*Ind. Eng. Chem.*, 1957/Nov./1823.)

### Synthesis of Vinyl Acetate in the Gas Phase

JAN JANDA describes and illustrates laboratory apparatus for evaluating the reaction kinetics in the synthesis of vinyl acetate from acetylene and acetic acid in the gas phase with zinc acetate catalyst. Optimum reaction temperature is about 190° C. The author also gives optimum concentration data for the reactants and the catalyst and the production of catalyst for continuous operation.
(*Chemické Zvesti* (*Bratislava*), 1957/Aug./478.)

### Adhesive for Plastics

THERE has recently appeared on the German market a neoprene-base synthetic adhesive for plastics. It is used directly without hardeners and without application of pre-coatings to the material which is to be stuck. It is stable and needs no stirring. It does not deteriorate if left exposed for reasonable periods to the air. It is economical in use (about ½ lb. is sufficient to cover more than one square yard) and to assure adhesion needs only hand pressure. It will stick plastics to any other material such as metal, wood, glass, leather, or other plastics. Known as Ardal-Kontakt Adhesive 528, this material should be applied in use to perfectly clean moisture-free and grease-free surfaces which, in cold weather, should be warmed somewhat; the adhesive itself may also be warmed. After application to the surface to be stuck, it is left exposed to the air for 15–20 minutes, or in the case of plastics glued to metal, for 30 minutes, and then when the adhesive film no longer adheres to the finger when it is touched, the two surfaces may be brought together, taking care to remove any air bubbles which may have occurred by pressing lightly with the finger. When used on steel sheet the application of pressure for a short time improves the result obtained.
(*Der Plastverarbeiter*, 1957/Oct./373.)

### Synthetic Rubbers

A 20 page guide to the properties and uses of synthetic rubbers has been compiled by M. W. Riley. The guide gives a summary of the latest information on the ten basic types of synthetic rubbers dealing in each case with their properties, compounding and availability. Many tables for easy reference are included and a general comparison of natural and synthetic rubbers in tubular form completes this special summary.
(*Mat. in Design Eng.* 1957/Sept./129.)

### Copolymers

AN elementary approach to the physics and chemistry of various types of copolymer by Ferraris. Particular attention is given to the differentiation of various types by reference to its characteristic macro-molecular structure.
(*Materie Plastiche*, 1957/Sept./707.)

### Foamed Polyurethanes in the United States

AN account by Krause in which, after an introductory section dealing with the chemistry of the polyurethanes, the author goes on to describe methods of foaming. A mass of tabular data is presented and the account concludes with a lengthy bibliography of American sources.
(*Kunststoff-Rundschau*, 1957/Dec./518.)

### Lacquer Coatings for Plastics

ALTHOUGH fully-pigmented plastic items yield, naturally, the best service, nevertheless plastic objects coated with a suitably coloured lacquer are also of great commercial interest. Foulon in a short account, notes that in order satisfactorily to lacquer a plastic surface, it must first be freed of all grease, this requiring the use of organic solvents with little or no action on the plastic surface. Sand blasting may also be of value, but, as contrasted with metallic surfaces, chemical etching processes have found little application in the case of plastics. The nature of lacquers to be used on different types of natural and synthetic resins is then dealt and it is noted that for injection mouldings in cellulose acetate, care must be taken that the plasticizer does not diffuse from the moulding into the lacquer, thus rendering the latter tacky; a lacquer must be chosen which is not so affected. Two-component-lacquers on a polyurethane basis may be used. In the case of phenolics a ground-coat of an oil containing alkyd resin may first be applied followed by a pigmented stoving lacquer applied by dipping. It is noted that the lacquering of coloured articles made of unsaturated polyesters increases both the water resistance and weather resistance of these materials, and a two-component primer (on a polyurethane-polyamine basis, or epoxy-polyamide basis) may be used followed by the use of a nitro cellulose or alkyd resin finishing coat. It is stated that lacquered epoxy resin insulators show electrical properties superior to those of porcelain. The difficulty of lacquering polyethylene is commented upon; normal lacquers give very poor adhesion on this resin. Alkyd resin lacquers dried at room temperature give the best results, but, it is observed, considerable use is made of the offset printing process using oil colours for the purpose of decorating polyethylene. Reference is made to a special pre-treatment of the polyethylene prior to printing in order to make the colours proof against washing and rubbing, but no details are given. For the lacquering of polystyrene, acqueous dispersions of suitably coloured synthetic resins may be used, or alternatively solvent-free oil colours. P.V.C., both plasticized and unplasticized, may be lacquered with copolymers of vinyl chloride and vinyl acetate; in this way, surface imperfections in the base material can be obscured, or pleasing variations of surface shade may be achieved.
(*Der Plastverarbeiter*, 1957/Nov./412.)

## MACHINERY

### Mixing in Laminar-Flow Systems

A THEORETICAL treatment of mixing in laminar-flow systems has been needed in the plastics industry to guide the design of compounding processes.

The concept that the mechanism of mixing is the generation of new interfacial surface by shear permits goodness of mixing to be related to the amount and orientation of the initial interfacial surface and the net shear strain imposed. The calculation was carried out for an initial system of discrete cubes. For this

case the effect of differences in viscosity between the components was derived.

This approach permits the energy required to attain a given uniformity of composition to be calculated from the properties of the feed materials and the flow patterns of the mixing device.

(*Ind. Eng. Chem.*, 1957/Nov./1855.)

### Mixing in Single-Screw Extruders

PREVIOUS theories of melt extrusion have not treated mixing performance.

Equations were derived to relate mixing performance to screw geometry and degree of pressure flow. The zone of poor mixing found near the midradius of extruded rod is predicted by the theory. The calculated goodness of mixing improves with decreasing helix angle, increasing thread depth, and increasing pressure flow. The last effect agrees qualitatively with experiment.

Mixing performance of extruder screws can now be calculated, and balanced against other requirements, such as output and power consumption.

(*Ind. Eng. Chem.*, 1957/Nov./1857.)

## TESTING

### Testing the Electrical Qualities of Plastics

ELECTRICAL testing of plastics comprises resistance measurement; dielectric measurement, breakdown voltage, special tests. Suhr reviews and comments on German engineering standards dealing with these tests, some apparatus for the purpose being listed. Resistance measurements are covered by DIN 53 482, dielectric measurements by DIN 53 483, breakdown voltage measurement by DIN 53 481, determination of the effects of exposure to the electric arc by DIN 53 484, resistance to tracking by DIN 53 480.

(*Der Plastverarbeiter*, 1957/Oct./3741.)

## TECHNOLOGY

### Drawing Thermoplastic Resins

BRENNECKE discusses practical aspects of the drawing of plastic sheets. The author explains the importance and the function of the pressure plate and shows how the production of unequal wall thickness in the finished drawn work may be largely eliminated. He indicates how, in calculating blank sizes, advantage may be taken of the fact that drawn work in p.v.c. tends to regain its original flat form on warming.

(*Kunststoff-Rundschau*, 1957/Nov./480.)

### Oxidative Degradation of Epoxy Resin Coatings

TO clarify the mechanism of degradation of epoxy coatings, studies were made on the oxidation rate of acid-cured epoxy films. The parameters investigated included air-dry time, duration and severity of curing cycle, film thickness, and resin molecular weight.

Epoxy films aged in oxygen at 180° C. absorbed oxygen, increased in density, and lost weight. Infra red studies showed that hydroxyl groups disappear and carbonyl groups appear in the molecular structure during oxidation, and the permeability of these films toward helium decreases as they are oxidized.

The theory of film failure developed stresses the effects of dimensional changes on the loss of good protective coating properties. The most stable epoxy films are thicker than 1 mil, cured at temperatures below 250° C., and formulated to contain the least unreacted epoxide groups when cured.

(*Ind. Eng. Chem.*, 1957/Nov./1897.)

### Thermal Stability of Resins

THERMAL degradation in thin films of isomeric and silicone-modified alkyd resins, and a pure silicone resin was studied by infra red spectroscopy. With this technique it was possible to follow the changes of each organic group separately.

Thermal stability of ortho-, iso-, and terephthalic alkyds and pure silicone resin were compared and found to be approximately in the ratio of 1:60:100:21,000, respectively. Silicone-modified alkyds show improved heat stability because silicone persists after the organic resin is lost. Infra red data indicate that degradation in these resins involves largely attack on small organic groups.

By pinpointing heat-susceptible portions of polymers, these studies suggest how thermal stability can be improved.

(*Ind. Eng. Chem.*, 1957/Nov./1903.)

## APPLICATIONS

### Plastic-Coated Steel Sheet

A REVIEW by Kalpers of the composite material, plastic-coated metal sheet known in America as Marvibond and in Europe as "Skin-plate." Some attention is devoted to the mechanical properties of the coated material, its resistance to solvents, insolation and weather, and to moisture resistance and wear tests. It is noted that care should be taken in using this material in contact with foodstuffs, unless it is known that the plastic coating is free from poisonous dyestuffs and stabilizers.

(*Der Plastverarbeiter*, 1957/Nov./406.)

### Protecting Pipe Surfaces

AT a symposium on corrosion protection held in Essen during April, 1957, Ritter von Rüling read a paper on the corrosion protection of pipe lines and civil engineering structures by hot spraying and flame spraying. He points out that among the properties necessary for an effective corrosion protecting medium, the most important are freedom from solvents in order to avoid formation of pores; ability to be applied to an effective thickness in one coating, this coating to be capable of being put into immediate service without need for drying time; the formation of a smooth, water-repellant surface. The surface to be sprayed should be absolutely dry and preferably warm prior to application of the protective medium. If the surface to be treated is at all porous, care should be taken that no harmful residual chemicals remain on porous spots; they should be removed before application of the coating. The media used may be in liquid form, paste form, or as solids. The author then deals with hot spraying, and with the flame spraying of molten media and dispersions. Very detailed reference is made to the Colarit flame-spraying process. Although dealing principally with protective coatings on a coal-tar basis, the writer observes that in many cases preliminary coatings consisting of synthetic resins with additions of passivating agents may be applied. Various testing method for perfections of coating are indicated.

(*Kunststoff-Rundschau*, 1957/Dec./513.)

### Thermal Insulation of Workshops

BAUMANN points out the method of construction commonly used for workshops is such that both at the walls and the roofing they are characterized by bad thermal and sound insulating qualities. He describes in detail treatment of a factory on site with urea-formaldehyde resin foam available under the name "Isoschaum" from Schaum-Chemie Wilhelm Bauer K.G., Essen, Ruhr, Huyssenallee, 44.

(*Der Plastverarbeiter*, 1957/Nov./410.)

### Plastics Prove their Building Potential

THE various applications of structural plastic materials are discussed in this report, which states that in some categories they are already equal in position to metals and wood and indeed sometimes first choice in construction materials. The building industry are using more and more plastics (figures are given) in their building schemes and in the future these materials may provide complete homes. Over the next five years, the producers say, that the increase in plastics employed in this way will be greater, and range from plumbing systems to roof coatings which reflect high temperatures.

(*Chem. and Eng. News*. 1957/Oct. 28/68.)

### Plastics Chemical Piping

A REVIEW of thermoplastic pipe materials for use in chemical plant is given by J. P. Kelleher and C. L. Mantell. Besides drawing attention to the suitability of thermoplastics for chemical plant emphasis is given to their limitation so that their application is only considered for controlled condition. Although their tensile strength and modulus of elasticity of thermoplastics is lower than for metals they are not subject to electrolytic corrosion as are the metals. A list of fittings available in rigid p.v.c. and a table of working pressures is included in the detailed information of this article. The final paragraphs compare the costs between metal and plastics piping.

(*Chem. Eng.* 1957/Nov./296.)

### Plastics in Boatbuilding

A CRITICAL review of the application of plastics in boat-building with special reference to the competitive economics of plastics and steel construction. In particular, ample reference is made to the activities of Dutch companies in this connection. Among the organizations referred to are: N. V. Amsterdamsche Scheepswerf; Mulder and Rijke, Ijmuiden; Van Rietschoten en Houens N. V.; Van der Stadt (Zaandam); Van der Valk (Haarlemmerliede).

(*Plastica*, 1957/Oct./664.)

# LETTERS TO THE EDITOR

*Correspondents are reminded that a stamped addressed envelope should be enclosed in all cases where a personal answer is desired. It is understood that any letter received may be published at the discretion of the Editor.*

### Education and Plastics

SIR,—On Tuesday, December 17, 1957, I was one of those present at the evening meeting of the London Section of the Plastics Institute at which the Assistant Editor of *Plastics*, Mr. C. W. Welch, gave an excellent and very interesting paper on "The Plastics Industry, Institute and Press." The discussion afterwards waxed strong and unfortunately for many had to be ended.

The subject of the Associateship of the Plastics Institute came under heavy fire, and I was wondering whether my experiences would be worth passing on to your readers.

I commenced my studies (part time) for the Diploma in 1945 at the Northern Polytechnic, National Service intervened, and I completed the course in 1949. At that time there were no courses for Associateship, so I had to proceed via the exemptions path, gaining as I proceeded, the Higher National Certificate in Mechanical Engineering.

I was awarded my Associateship in 1954, and on informing a colleague who was B.Sc., A.R.I.C., A.P.I., he said "you have the privilege of possessing a qualification that will not be recognized in the Industry for at least ten years." Such thoughts were not unknown to me and I felt bound to agree.

Later on when applying for posts with various Companies in the Industry the reaction was the same, "A.P.I.—grunt," "H.N.C. Mechanical Engineering—Good. As moulders we want Engineers not Chemists." The full nature and significance of the Associateship of the Plastics Institute is certainly only vaguely known and recognized, and much will have to be done to inspire respect and confidence in that qualification.

A. W. KINGSMAN, A.P.I.

Fraser and Glass Ltd.,
London, N.12.

### Plastic Wheels

SIR,—We wish to obtain addresses of manufacturers of plastic wheels (1" and 1½" dia.) suitable for use on wooden toys.

We were unable to trace any advertisement making a reference to this type of article in your journal but we feel sure that such items are manufactured in this country.

We would be grateful if you could advise us of any suitable addresses to which we could send our enquiries.

GEORGIANS.

8 Horsecombe Brow,
Combe Down,
Bath, Somerset.

### Plastic Balls

SIR,—We are anxious to obtain the names of suppliers of plastic balls. Our particular requirements are for 1¾ in. and 2 in. balls of a polished coloured nature and incorporating if possible a hole that is of a size for cap fitting on to ⅜ in. rod.

If manufacturers do not make them with holes, we, of course, could drill these.

R. BENBOW & CO.
(MODERN SHOPFITTERS) LTD.

Petitor Road,
Torquay.

### Plastic Easter Novelties

SIR,—We are interested in plastics novelties suitable for Easter trade. Could you give us the name and address of manufacturers who produce this class of goods?

UNITED SALES.

27a Bedford Street,
Belfast,
N. Ireland.

### Nylon Drain Cocks

SIR,—We have learned that some nylon laboratory drain cocks marked:—

PL 3501
Polyamid / Nylon
Labor / Armatur

have been delivered to this country, and assuming that these cocks are of British origin, we ask you to be so kind as to put us in touch with the manufacturer, as we are interested in having a quotation for ½-in. cocks, both angular and parallel ones.

BANG & PINGEL A/S.

Copenhagen V—Post Box 361,
Denmark.

### P.V.C. Sheet

SIR,—We are anxious to find a source of supply for comparatively small quantities of soft plasticized p.v.c., preferably white and 3/16 in. thick. We are wondering whether you could put us in touch with a source of supply for this material.

C. B. FROST & CO., LTD.

9/10 Shadwell Street,
Birmingham, 4.

### Dishes

SIR,—We wish to produce a limited quantity of thin plastic dishes about 12 in. square with 1-inch sides. Is there a method of pressing these from plastic sheet with a simple machine and if so what type of plastic material should be used.

C. R. LUCY.

Target Manufacturing Co.
Wollaston,
Near Wellingborough.

The following letter has been circulated to the managing directors of companies in the plastics industry.

### Integration of Academic and Industrial Training in Courses Leading to the Diploma in Technology

SIR,—The Diploma in Technology to be awarded by the National Council for Technological Awards, is intended to be the equivalent of an Honours Degree. It will correspond, not to a B.Sc. in pure science, but rather to the B.Sc. Tech. awarded by some universities. The courses for the Diploma in Technology differ from the typical degree course in one important respect, namely that *organised* industrial training is essential; the courses are designed for the future production manager rather than for the research chemist.

The four-year sandwich course in Chemical Technology with specialisation in Plastics and High Polymer Science and Technology, began at the Polytechnic in September with an initial registration of 11 students, nine "College based" and two "Works based." Details of the course and of the industrial training programme envisaged are given in the enclosures.

The students will spend alternate periods of six months in the College and in Industry. It would no doubt, be possible for the students to go to a limited number of firms in London and the home counties, but it will be in the interests of the students, —and ultimately of industry—if the training plan can be worked out on a wider basis. It is for this reason that this letter is being sent to you in the hope that your firm may be willing to participate by agreeing to accept a trainee for the six months period March–September 1958, or for some subsequent period.

The Polytechnic has an Advisory Committee on Plastics Technology, with strong representation from industry. The members of this committee trust that a number of firms may be willing to co-operate in the training plan and that firms may be able also to send sponsored students to the new course to begin in September, 1958. It would be in the interests of the students and of the College if applications for the 1958 course could be made as soon as possible, and preferably before March 30th, 1958.

JAMES E. GARSIDE
(*Principal of the Polytechnic*)
D. S. MAHON
(*Chairman of the Advisory Committee on Plastics Technology*)

(*Editor's Note.*—It would be helpful if inquiries from firms could be addressed to Dr. F. Aylward, Head of the Department of Chemistry, Borough Polytechnic, London, S.E.1.)

# New Productions

### Polyethylene Film for Lining Concrete Moulds

By using film made from Bakelite polyethylene for lining wooden boxes employed in moulding concrete shapes such as slabs or posts, substantial production economies can be made, and the quality of the end product considerably improved.

Normally, boxes used in moulding concrete have to be constructed from good quality wood, and the inside surfaces require a good finish in order to produce an equivalent finish on the moulded concrete. In addition, the corners of the boxes have to be sealed to prevent leakage of water or concrete mix. However, when polyethylene film is used as a liner, the boxes can be made from less expensive wood, no special finishing is necessary and the corners of the boxes do not need to be sealed—tucks are made in the film so that it covers the corners and prevents leakage. The polyethylene film protects the inside surface of the box against wear by the concrete, and because the polyethylene film is smooth, the concrete will not stick to it and will not build up anywhere inside the box. This means that boxes can be used for a great many moulding operations, and replacement of the boxes is virtually eliminated.

Release of the concrete from polyethylene lined boxes is extremely good, and the surface finish of the final product is excellent, being free from grain markings, small holes, etc. A further advantage in using polyethylene film is that it does not allow moisture to evaporate from the mix, and thus enables the concrete to cure more effectively, giving a harder finished product. When cured, the concrete is a light grey colour approaching white, and for certain applications this means that cheaper types of cement can be used in place of the more expensive " white " cements.

### Moulded Chess Set

As long as the game of chess has been in existence, master craftsmen have devoted themselves to the creation of elaborate sets—many of which are now precious pieces of art—using bone, ivory, rare woods, mother-of-pearl, gold and jewels.

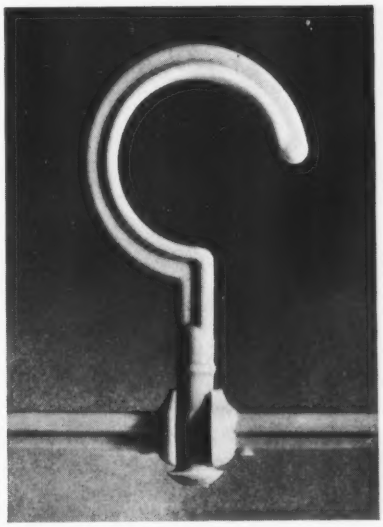
Today a California sculptor, Peter Ganine, is utilizing a completely new material—melamine plastic—to introduce a major change in chess set design.

His set features a fundamental Gothic design which is startling in its simplicity and clean lines. Every chessman, including the pawn, has a distinctive face rising out of a small, curved pedestal.

This is in sharp contrast to today's standard chess set—designed in 1849 for mass production by an Englishman, Howard Staunton—with its impersonal lathe-turned, faceless kings, queens and bishops, and its horse heads representing knights.

Plaskon melamine, a product of Allied Chemical International, was chosen for the white chessmen, according to Ganine, because it takes on the appearance and pleasant feel of ivory, is highly break resistant and virtually scratch-proof, and does not have a mass-reproduced appearance. Unlike phenolic, of which the red or black pieces are moulded, melamine can be moulded in light colours.

The chess pieces are formed in a tube transfer mould utilizing nine cavities—two cycles produce one half-set of chessmen. Charging the mould for one cycle requires 650 grams of melamine. The melamine is pilled and pre-heated prior to charging at a mould temperature of 300° F.



Drip-dry hanger moulded in polystyrene by Martin-Golod Products Ltd., Maybury Gardens, High Road, Willesden, N.W.10.

### Switchgear Moulding

Birkbys Ltd., of Liversedge, Yorkshire, make the four mouldings—base, bridge contact and bobbin mouldings—contained in the contactor illustrated which is produced by Messrs. British Klockner Switchgear Ltd.

The tools for the base and the bridge mouldings are of the semi-automatic transfer type. In view of the complexity of shape, particularly of the base, a considerable section of the tools is composed of small parts built up to form the impression; in this way accurate machining is made possible. The transfer principle is used in view of the delicate tool parts and intricate shapes.

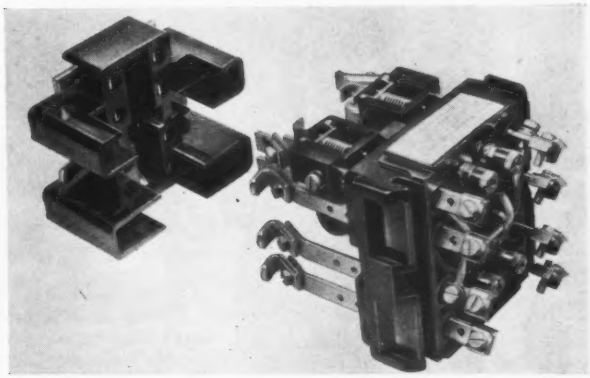
A semi-automatic compression tool produces contact mouldings; the " + " and " – " shaped recesses on either side of the mouldings are produced by retracting side cores operated by cams.

Semi-automatic transfer tools with taper split forms produce bobbin mouldings.

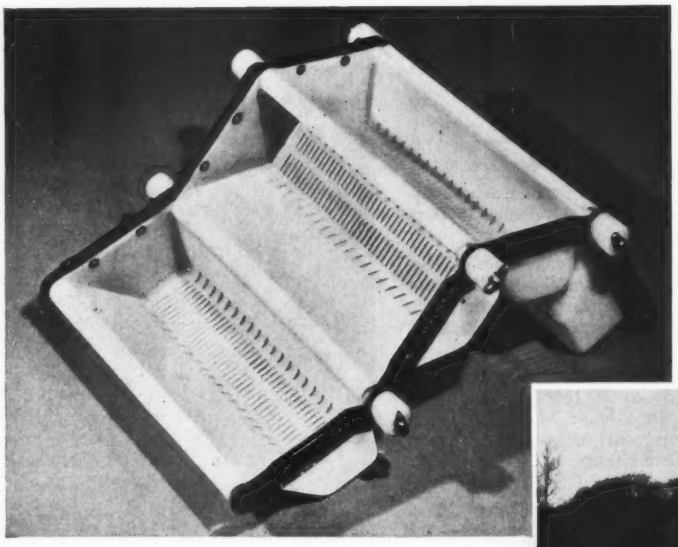
All tools were made in Birkbys' own tool room.

The material used for these mouldings is Birkbys ELO Grade S.O.1 improved general purpose phenolic powder.

The model and the moulding of a new chess set designed by Peter Ganine and utilizing melamine and phenolic plastics.



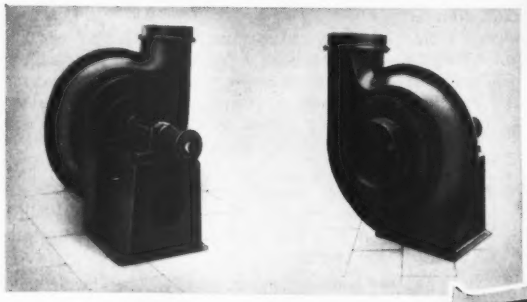
Phenolic switchgear mouldings produced by Birkbys Ltd. in their own material for British Klockner Switchgear Ltd. These mouldings incorporate a high degree of dimensional accuracy and skill in mould design to produce the intricate shapes required.



(Left) The illustration shows the first all-plastic conveyor bucket for the fruit and vegetable canning industry. Cascelloid have produced this standard sized conveyor bucket in a special grade of heat-resistant polythene. This ideal combination of polythene, with nylon straps and rollers, gives several advantages. The buckets are manufactured by Cascelloid Division of the British Xylonite Co., Ltd., Abbey Lane, Leicester.

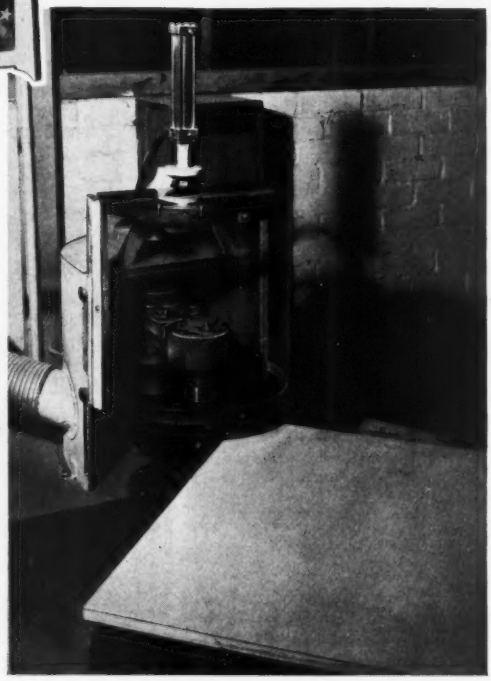
(Below) The production of a new type of miniature all-plastics runabout—the Microboat—is announced by Microplas Ltd., the James Estate, Mitcham. (The illustration shows Miss Petula Clark who recently took delivery of one of these craft.) The hull is made with self-coloured Cellobond polyester resin and chopped strand mat Fibreglass. It is a one piece moulding constructed in a split mould. The seat, which accommodates two comfortably, is moulded separately and also serves as a buoyancy chamber. Blocks of expanded polystyrene are sealed within the chamber. The windscreen is of flexible Geon p.v.c.

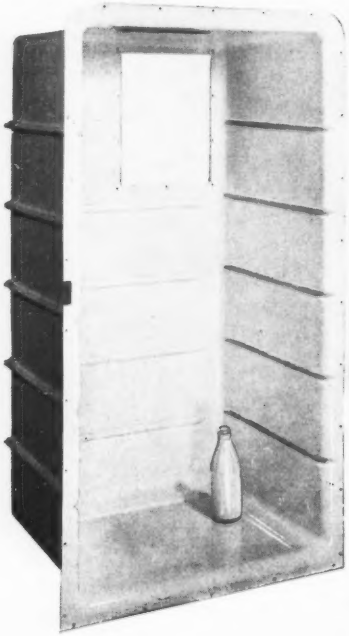
(Below) The Sturtevant Engineering Co., Ltd. have recently announced that in conjunction with Acalor (1948) Ltd. they have produced a range of moulded p.v.c. fans based on their original Monogram series. These fans, designed particularly to meet the ever growing need for exhausting corrosive fumes have moulded casings and fully moulded p.v.c. impeller.



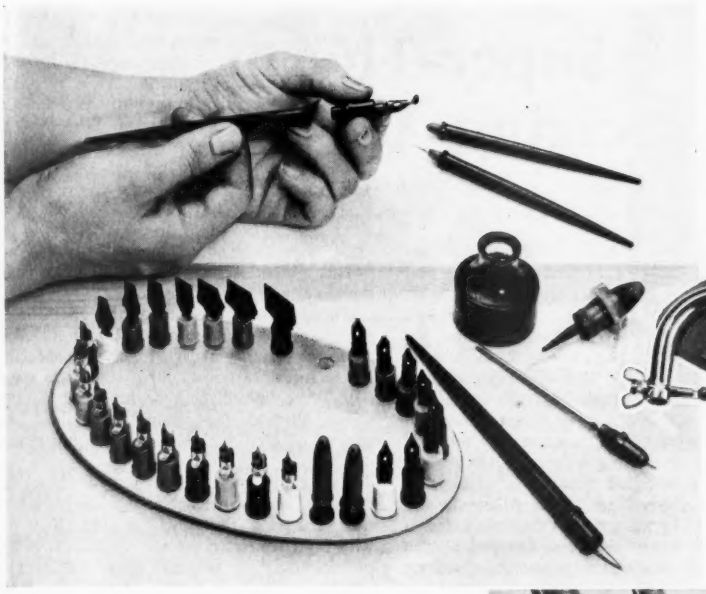
(Below) Josephina Vasconcellos, F.R.B.S., with a cross of unusual character, made to her design constructed of Perspex and natural polished oak. It is a blue cross by day, and a golden one by night, when it is illuminated by the lights of the church.

(Below) This automatic spindle moulder is equipped with a pneumatically operated guard fabricated from Bakelite Vybak DVB 229 transparent sheet, $\frac{1}{4}$-in. thick. The sheet is semi-rigid and will withstand a considerable amount of mechanical abuse without shattering.





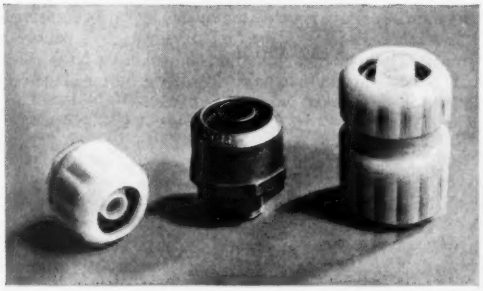
(Left) Claimed to be the biggest vacuum formed refrigerator liner in the world, this giant illustrated here has a capacity of over 13 cu. ft. Manufactured by Messrs. Clearex Products Limited from approximately $\frac{3}{16}$-in. thick Iridon high impact polystyrene sheeting, the refrigerator liner measures nearly 4 ft. in height, and is over 20 in. deep and 2 ft. across.

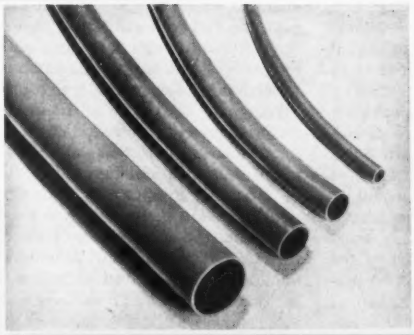


(Left) Artists and draughtsmen have a wide array of pen points at their immediate command in this new Di Carlo set of nibs moulded of Tenite butyrate plastic. The pen set is manufactured by Di Carlo Pen Company, 3 Station Road, Madison, N.J., U.S.A., and moulded by Tech-Art Plastics Company, Ridgedale Avenue, Morristown, N.J., U.S.A.

(Below) The Steadfast hacksaw frame manufactured by J. Stead & Co., Ltd., Sheffield, 2, incorporates an entirely new type of translucent amber plastic handle. The frame is sold complete and is fitted into a translucent plastic wallet.

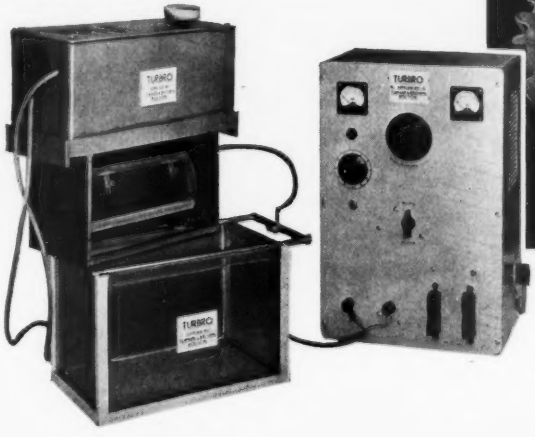
(Below) Two types of couplings manufactured in nylon and suitable for working pressures up to 250 p.s.i. are available from the Engineering Divn. Airtechs Ltd., Haddenham, Bucks. The type D is for the purpose of joining two lengths of rubber or plastic hose together. On the type S, one end of this coupling is threaded for attachment to a tool, or to a supply point where the coupling can remain permanently.

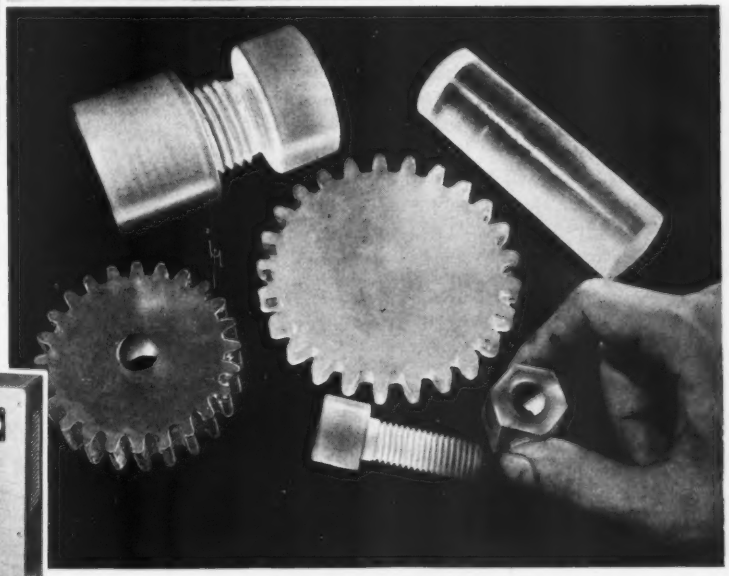




(Left) Thin wall p.t.f.e. tubing in sizes of $\frac{1}{8}$ in. i.d. to 1 in. i.d. is now being supplied by Polypenco Limited, 68–70 Tewin Road, Welwyn Garden City, Herts. Nominal wall thicknesses are .030 in. on sizes through $\frac{5}{8}$ in., .040 in. on $\frac{3}{4}$ in., .045 in. on $\frac{7}{8}$ in. and .050 in. on 1 in. All sizes can be supplied in ten coded colours for circuit or fluid identification.

(Below) Turner and Brown Limited, Bolton, have designed and manufactured the Turbro miniature barrel plating unit of 20 oz. capacity resistant to all solution up to 60° C. The unit comprises a Rectifier with automatic timing device controlling the D.C. supply to the bath and the supply to the A.C. motor, two p.v.c. tanks and the p.v.c. plating barrel. P.v.c. gears permit a barrel speed of 14 r.p.m.



(Above) Urethane potting resins, exemplified by these odd-shaped samples, may be used for encasing or encapsulating electrical and electronic components. Finished units are resistant to moisture, impact and a wide range of chemicals. These samples are made from Allied Chemical & Dye Corp. material.

*Machines for the Industry*

# Dykehouse Super-Therm Pre-Plasticizing Unit

*An analysis of the equipment and an account of its performance, prepared with the co-operation of Alfred Herbert Ltd., and Cooke & Dykehouse Plastic Machinery Co., Ltd.*

THE history of the Dykehouse Super-Therm pre-plasticizer is one of several years of experience using this type of equipment, and the results of many years experience in testing, in actual production, these units on various types of injection machines on all types of materials.

The units have been designed with the specific object of being simple in operation, with complete versatility, to be able to handle all materials and yet to be adaptable to standard new machines as well as conversions of existing machines now in operation in the field.

The primary object from an operational standpoint is first and foremost to decrease cycle times, secondly to improve quality, and thirdly to increase the capacity of a machine with virtually a very small increase in capital investment. Additionally, the purpose is to reduce material cost by metering and by elimination of " packing." As an example, it has been found possible with this type of pre-plasticizing unit to run on a standard 8 oz. machine over 70% of the moulds that are now operating on 16 oz. machines, with equal or faster cycle times and in every case with a distinct saving in material. This is most important since the capital investment of the 8 oz. machine with the Super-Therm pre-plasticizer is approximately 60% of the capital invested in a 16 oz. machine. These units have been designed around two basic and simple engineering principles that have been known in industry for many years. The unit has been broken down into two parts from the design standpoint, namely the plasticizing or melting chamber and the injection chamber. The plasticizing chamber is purely and simply a melting pot with a large heating area and with a proportioned amount of material plasticizing or melting relative to the size of shot. This so-called " boiler " principle is based upon the heat source being very close to the material by heating it in covered channels to within $\frac{3}{8}$ in. of the plastic material. The material is pushed through this melting chamber with a simple piston operating at low pressure, but with sufficient pressure to move the material through the mixing and balancing section of the separate injection chamber, which has sufficient pressure to squeeze out any existing air or voids in the material. The material leaves the injection chamber, which is a cylinder with a simple shut-off valve and an adjustable stroke injection piston. The amount of material injected is controlled by the positive action of the piston moving forward, displacing the homogeneous material into the mould. Exactly the same amount of material volumetrically is moved each time, as is done in other industries that handle liquids in exact amounts by simple methods of this type.

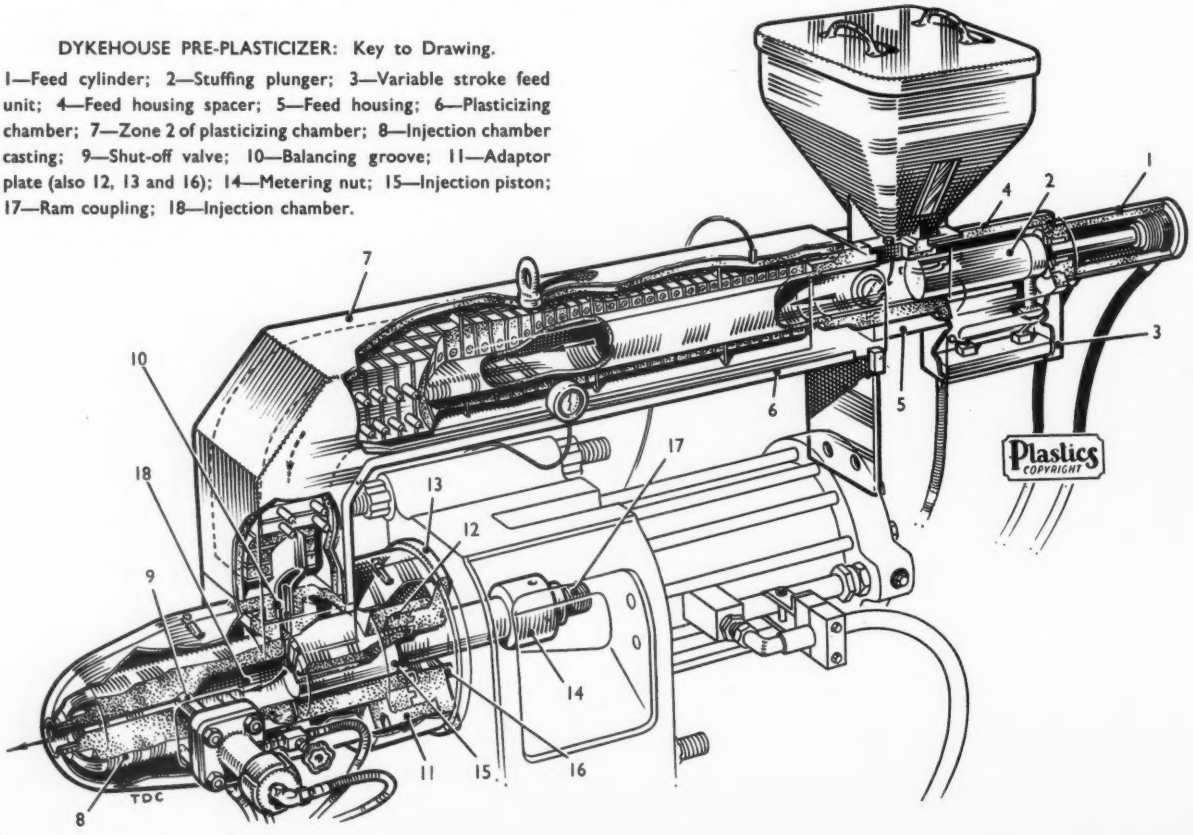
This system is most important since once the metering nut is partly set in the locked-in position, it is impossible for the operator to have shorts or flashes regardless of injection pressure or change in cycle times. It is specially important since considerable sums are spent every year in replacing or repairing moulds which, through inexperienced handling, are subject to continual flashing, causing severe damage.

The complete unit is manufactured of Nitralloy and stainless steel and it is these two basic materials that give the units long life with no danger of corrosion, regardless of the plastics materials that are used. Further, an important point is that the design lends itself to using existing unused space of the machine even though the plasticizing and injection capacities are always at least doubled.

The feed cylinder (1) is hydraulically operated. Both piston and cylinder are manufactured from Nitralloy steel. Cast-iron piston rings are used to give trouble-free service. The stuffing plunger (2) and sleeve are both made in heat-treated Nitralloy. The sleeve is easily removable by extraction screws. Exact weight is obtained by volumetric metering. Precision control of the stroke of the injection ram provides a true means of metering material into the die cavity.

**DYKEHOUSE PRE-PLASTICIZER: Key to Drawing.**

**1—Feed cylinder; 2—Stuffing plunger; 3—Variable stroke feed unit; 4—Feed housing spacer; 5—Feed housing; 6—Plasticizing chamber; 7—Zone 2 of plasticizing chamber; 8—Injection chamber casting; 9—Shut-off valve; 10—Balancing groove; 11—Adaptor plate (also 12, 13 and 16); 14—Metering nut; 15—Injection piston; 17—Ram coupling; 18—Injection chamber.**



A variable stroke feed unit is fitted (3), to compensate for the varying specific gravity and bulk factors of different types of material, and is readily adjustable by the stroke of the feed cylinder. When the switches are set at maximum stroke approximately 4½ oz. of polystyrene, for example, is picked up per stroke.

The feed housing spacer (4) between cylinder and housing which is threaded for quick disassembly of feed cylinder, spacer, sleeve and piston. The feed housing (5) with hopper shut off slide is drilled for water cooling controlled to maintain correct temperature.

Close-up view of the shut-off valve indicated on the drawing on the preceding page as item 9.

### Plasticizing Chamber

The plasticizing or melting chamber (6), is a patented heat transfer system, based upon the ability to replace heat evenly on the surface of the flow passage as rapidly as the heat is being transferred into the material with no decomposition of the material. The temperature is controlled to that at which the material will plasticize, and therefore eliminates any high temperature range as well as burnt material.

Zone 1 of the unit is controlled by a thermocouple touching the sheath of the heater which gives an exact reading of the heat transfer medium which is the electrical element itself. These heaters are within ⅛ in. of the surface which material passes through.

Zone 2 (7) of the plasticizing chamber with evenly distributed heat has a proportionately much lower heat input per linear inch than Zone 1. Temperature control is the same.

The injection or holding chamber casting (8), is in Nitralloy steel. Cal-rod type heaters are fitted in longitudinally drilled holes and form Zone 3.

The shut-off valve (9) is a Nitralloy spool type, precision ground, moving in a Nitralloy sleeve whereby the valve, sleeve and nozzle housing are assembled and the flow hole precision ground together which eliminates any chance of mis-alignment and colour change problems. This shut-off valve is controlled for rapid opening and closing a split second before movement of the standard hydraulic cylinder, by connecting into the four-way valve that moves the hydraulic injection cylinder. This is most important since if the shut-off valve closes before the ram returns it eliminates any pull back or bleed back.

### Main Assemblies

There are three main assemblies:

No. 1.—Feed assembly.

No. 2.—Plasticizing or melting unit.

No. 3.—Injection unit.

The general operation is as follows:

The material falls from the hopper by gravity in front of the feed piston which operates on a low pressure system of less than 4,000 lb. per square inch. The material is pushed into a heated stainless steel tube of greater diameter, without torpedo, and passes through this tube which changes in section from round to oval shape, thus reducing the cross section of the material to allow the heat to transfer evenly and completely through the material. This tube with many fins is similar to a radiator, and is fitted in a heavy duty metal box and filled with aluminium for the purpose of holding and transferring the heat evenly around all sections of the material passage. With this principle about 10 lb. of material is heated for a period of time at low heats. With no restrictions in this tube to cause pressure drop, there is no increase in temperature due to friction, and it is possible to use lower pressures. After the material passes from the plasticizing chamber it flows into the patented balancing groove (10) which does the following:

(1) Thoroughly mixes dry colour materials.

(2) Flushes off the head of the injection ram on each and every cycle.

(3) Keeps the injection piston in perfect balance with the injection chamber which eliminates bleed back around the ram.

(4) Pushes the oldest material forward first regardless of size of shot and eliminates the possibility of decomposition of materials that have short heat life.

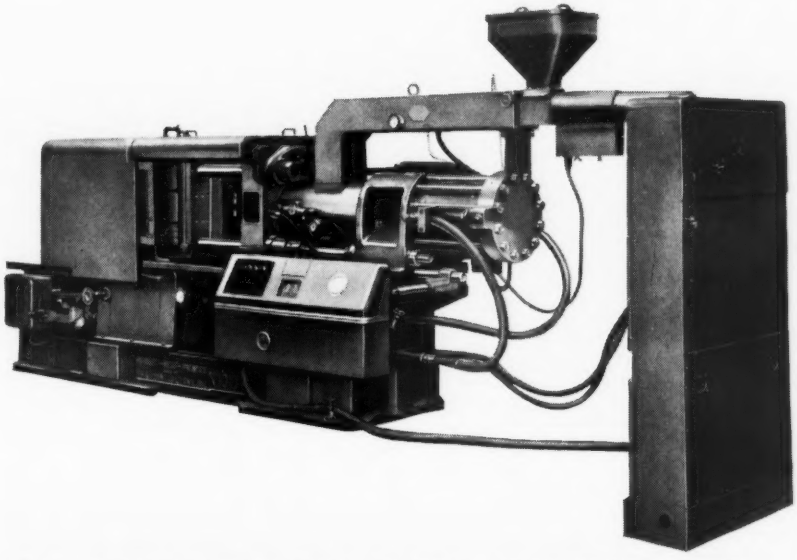
(5) It squeezes out all of the air when the shut-off valve (9) is closed, so that there is a complete mass of homogeneous material in this chamber prior to each shot, and acts as a shut-off valve between the injection and the plasticizing chambers.

The complete sequence is as follows:

When the press closes, the nozzle shut-off valve (9) is closed. The injection chamber (18), is filled with plasticized material and held under pressure by stuffing plunger (2). This pressure is held by the low volume side of the pump as the press closes. After the press has closed the injection piston (15) moves forward at full boost to a pre-determined length of stroke controlled by the metering nut (14). This length of stroke is positive and accurate and by using the full 6½ in. stroke the maximum shot capacity obtained is 24 oz. of polythene.

Items (11), (12), (13) and (16) are adaptor plates suitable for the 8-oz. Reed-Prentice machine. By removing the threaded collar (12) from the injection housing, any size or type of adaptor plate can be threaded or screwed on to suit other machines. This also requires a change in the cover and the ram coupling (17).

Pre-plasticizing units of this type are available from 2–300 oz. sizes, with plasticizing capacities of up to 800 lb. per hour. The equipment is manufactured by Cooke & Dykehouse Plastic Machinery Co., Ltd., 14 Cockspur Street, London, S.W.1.



The pre-plasticizer is shown here fitted to the IOD 8-oz. Herbert Reed-Prentice machine.

# The Use of Plastics in Latex Form—Part 2

By J. BRYDSON,* A.I.R.I., A.N.C.R.T.

*Part 1 of this article was published in the January issue, pages 11-13, together with the complete set of literature references covering both that part and the concluding instalment published here.*

### (9) Plasticizers

Latices from polyvinyl acetate, polyvinyl chloride, polystyrene, and polymethyl methacrylate do not form a coherent film on air drying at room temperature. This difficulty may be overcome by polymerization or by the addition of plasticizers.

With polyvinyl acetate, dibutyl phthalate is extensively used, the amount depending on the pigment and filler present. A value of 15% on the total plasticized solids may be taken as typical for eggshell finish emulsion paints. Other plasticizers such as dibutyl glycol phthalate, dimethyl glycol sebacate, tritolyl phosphate and chlorinated diphenyls are suitable alternatives.

A minimum plasticizer content of 40% on the total plasticized solids is required to produce a coherent air dried film of polymethyl methacrylate. Dibutyl phthalate is commonly used.

Dioctyl phthalate is a popular plasticizer for p.v.c. latex. The following table indicates how the properties of deposited p.v.c. film are influenced by varying the plasticizer (5).

| % *Plasticizer* | *Film Characteristics* |
|---|---|
| 0 | Friable powder. |
| 25 | Dry stiff film. |
| 50 | Dry flexible film. |
| 75 | Highly flexible film. |
| 100 | Elastic film with slight tack. |

Ammonium oleate is recommended as an emulsifying agent with p.v.c. latex, usually being formed *in situ*. Two different techniques have been described.

(1) The following mix is used (4):—

| | |
|---|---|
| Water .. .. | 33.40 |
| 28% Ammonia .. | 0.35 |
| Plasticizer .. .. | 65.00 |
| Oleic Acid .. | 1.25 |

Plasticizer and the oleic acid are mixed together and then added to a mixture of ammonia and water with stirring. The requisite quantity of the emulsion is then added to the latex.

(2) Alternatively a 10% ammonium solution is added to the latex and oleic acid is added to the plasticizer. The latter is then added to the former with simple stirring (5).

The last process is of course more direct in operation. Investigations with polystyrene latex have indicated that where plasticizers are added to the polystyrene the polymer is plasticized at the latex stage. This would mean that plasticizing does not occur immediately but takes time. It may therefore be expected that better results would be obtained with latices that have been allowed to stand for some time (14). J. I. Evans (8) has investigated a number of plasticizers for use with polystyrene. The following variable factors were considered:—

(i) The minimum concentration of plasticizer to give a continuous film on air drying.
(ii) The tensile strength, plasticizer loss rate, rate of migration, scratch hardness and water absorption of films using the minimum plasticizer.
(iii) The scrub resistance and outdoor weathering of paints made from such films.

It was found that with dioctyl phthalate, tritolyl phosphate, trixylyl phosphate and dioctyl sebacate, about 45 parts of plasticizer were required per 100 parts of polymer. The tensile strength and scratch hardness appeared to be virtually independent of the type of plasticizer, the former property being of the order of 450–500 p.s.i. Trixylyl phosphate showed a low loss rate, low water absorption, good scrub resistance and is of a low cost. This plasticizer would appear to be eminently suitable for polystyrene latex. Chlorinated diphenyls such as Aroclor 1248 and 1254 are also of use. They are claimed to give harder and more water resistant films and also better adhesion to tin plate. Aroclor 1248 is easily emulsified, Aroclor 1254 requires some heating to emulsify but gives a harder film.

*Lecturer, National College of Rubber Technology.

## Applications

### (1) Flooring

Before the Second World War flexible flooring materials were produced based on mixtures of cement, aggregate and natural rubber latex. These materials were superior to concrete floors in terms of resilience, resistance to cracking and wearing. The poor oil resistance of these compositions however limited their applications. Compositions based on synthetic rubber latices of the nitrile and polysulphide types were later employed but today polyvinyl acetate is mainly used for this purpose in this country. In the United States some work has been carried out with polystyrene (15) with success.

The compositions comprise four parts, polymer latex (16, 17, 18,) including plasticizer, cement, aggregate, and decorative ingredients. Either Portland cement or aluminous cement may be employed, the aluminous variety is quicker setting and stronger but is dark in colour. On the other hand the Portland cement is lighter in colour and cheaper. For the aggregate, such materials as sand, granite dust, gravel, slag, cork dust and vermiculite, may be used. To enhance the general appearance such items as mother of pearl chips, pigments and even polystyrene pellets may be incorporated.

A typical mix would be:—

| | |
|---|---|
| Portland cement .. .. .. | 1 pt. by weight |
| Sand .. .. .. .. | 3 pts. by weight. |
| P.V.A. emulsion 56% solids .. | 0.5 pts. by weight. |
| Dibutyl phthalate .. .. | 0.1 pts. by weight. |
| Water .. .. .. .. | 0.25 pts. by weight. |

The latter three components are mixed together, then stirred into the cement and sand on site and then trowelled onto a suitable sub-floor. This must be level and either have been soaked with water or primed with p.v.a. latex in order to obtain a good key. Wood and cement are the most common sub-floors used. The compositions are usually laid about ¼ in. thick and have the appearance and feel of good quality linoleum. The flooring is hard, dustless and greaseproof, there are however some limitations in water resistance and therefore would not be used where frequent contact with water is to be expected.

### (2) Adhesives

Polyvinyl acetate latex is an extremely versatile adhesive material. Compounded latices now find acceptance for such applications as furniture gluing, packaging, bookbinding, and as a leather adhesive. There is also interest in plasticized polystyrene latices for similar purposes.

The furniture industry has readily accepted p.v.a. as a woodworking glue for the following reasons:—(19) readiness for use, fast setting, flexibility, colourless, clarity and good strength. Possible disadvantages are limited durability and water resistance, thermoplasticity, cost, creep tendency, and with veneering the reaction of the adhesive with polish solvents. Incorporation of low boiling solvents increase the initial tack and high boiling solvents the delayed tack. The equipment used in the furniture industry has been described (20).

**(3) Wire Coating**

Although wire coating with latex is a feasible operation it is not normally of commercial importance since the presence of surface active agents leads to a reduction in the electrical properties. Recently it has been found possible to coat wire with thin layers of p.t.f.e. from latex using wire enamelling procedures (11). Because of the thermal stability of the polymer it is possible to remove the soaps during the high temperature baking operation. In this process wire treated with a suitable wetting agent is passed upwards through a rubber diaphragm into a bath containing the dispersion. The coated wires are then passed through an oven in order to fuse the polymer at temperatures of the order of 400° C. Such wires may be used in high temperature insulation equipment running continuously at 200° C. and intermittently at 250° C.

**(4) Film Forming**

P.v.c. and p.t.f.e. latices are sometimes employed in casting film. Films from the former material are employed as packaging materials with good greaseproof properties and low moisture vapour transmission (4) whilst p.t.f.e. (11) films find use in the electrical industry for condenser insulation and other purposes.

P.v.c. copolymers are most frequently employed, one commercial material is air drying. The latex is cast onto a metal or glass surface, dried under infra red lamps and then in order to reduce the moisture transmission subjected to a short heating period at 150° C.

There are five stages in the manufacture of p.t.f.e. film, casting, drying, baking, cooling and stripping. Casting may be carried out onto glass, nickel, aluminium or chromium surfaces. About 0.001 in. thickness may be cast at a time. After dipping a short drying period under infra red lamps or in warm air, is followed by baking in an air oven at 380° C. At this stage the particles of p.t.f.e. are sintered into a continuous film. Stripping of the film is simplified by quenching the film rapidly after baking.

**(5) Textile Finishing**

" Plastics " latices are used extensively in textile finishing and coating.

Polyvinyl acetate is used for imparting a crisp finish to textiles. A one-bath process is used, the viscosity being adjusted by additions of starch (21). P.v.a. latex is also used as the basis of domestic permanent " starches," for retexturing after dry and wet cleaning, for laminating stiff cuffs and collars and when plasticized, for sizing rayon. Miscellaneous uses are in felt manufacture as a replacement of shellac, for hem binding, as a binder for non-woven fabrics and in carpet manufacture.

Plasticized polystyrene latices have similar potentialities and have already been used for such purposes as a binder for hair and fibre used in cushions, to impregnate canvas and thus enhance the water resistance of the material, and as a binder for non-woven fabrics (7).

Acrylic materials find some use in finishes where coatings with good gloss, oil and grease resistance are required. Polymethyl methacrylate latex finds use as an anti-tack coating for p.v.c. leathercloth materials.

Both p.v.a. and polymethyl methacrylate latices are available as positively charged emulsions. These are substantive to negatively charged fibres and are used for applications such as anti-snag finishing for nylon hosiery. These materials are normally applied at low resin concentrations in a dyebath which becomes exhausted in the process (12).

In the preparation of high quality oilskin materials, p.v.c. latex is frequently used. It may be applied to the cloth by the normal methods of doctor, knife, impregnation, and in some instances, roller coating. The latex is normally plasticized with about 60% of a suitable ester plasticizer (on the dry weight of the polymer solids) and a thickening agent.

It is not normally either feasible or desirable to treat fabric materials, other than glass and asbestos with p.t.f.e. latex as the baking temperatures required are above the fabric decomposition temperatures (11).

**(6) Glass Fibre Impregnation**

A number of latices are used in conjunction with glass fibre, in particular p.t.f.e., p.v.a., and polystyrene latices.

P.t.f.e. latex is used to impregnate glass fibre in the production of wrappings and laminates for use in the electrical industry (11). Fabric freed from any combustible sizing agents is dipped into the latex, if necessary a number of dips may be carried out to build up the desired thickness, and drying is effected after each dip. It is noticed that at the end of this stage of the process that the polymer has formed itself into a number of " mud cracks " that would not cohere on baking. It is therefore necessary to close the cracks by calendering between padded rolls. The fabric is then baked at 360–400° C. to fuse the film. Laminates may be obtained by stacking impregnated fabric in a press and baking under pressure at the above temperatures.

Glass mat impregnated with polystyrene latex, dried at 65° C., and fused at 180° C., is used for such purposes as battery separators.

Polyvinyl acetate and butadiene-styrene latices are employed as binders in chopped strand glass fibre mat used in the manufacture of glass reinforced plastics.

**(7) Leather Finishing**

A number of the synthetic rubber latices have found use in the leather finishing industry for some years. A number of acrylic latices are now marketed particularly designed for this industry. These include the butyl, nonyl and ethoxy ethyl methacrylate polymers and copolymers. Applications of these materials include sealing, fast bottom coatings, pigment binders and top finishers (12).

**(8) Emulsion Paints**

Polyvinyl acetate finds considerable use in Great Britain in the manufacture of emulsion paints (12, 21, 22), polystyrene and butadiene styrene latices also finding some use.

A number of grades of p.v.a. latex are now available which possess improved behaviour in such properties as scrub resistance, freeze thaw stability and where copolymers are used low plasticizer volatility.

Correspondingly there has been development in the formulation of paints. Additives used include plasticizers, stabilizers, fillers, pigments, tinting agents and thickeners. Plasticizers such as dibutyl phthalate may be stirred into the latex, with some grades gentle heating is necessary. Fillers and pigments are added to the plasticized latex as dispersions, it normally being necessary to add extra stabilizer. This stabilizer may also function as a thickening agent and products such as sodium carboxy methyl cellulose are frequently employed. Care must be taken in formulations since this has an effect on such properties as scrub resistance and gloss.

**(9) Paper Treatment**

Latices of polyvinyl acetate, the polymethacrylates and styrene copolymers are useful as non-yellowing protective and high gloss coatings for paper and board. P.v.c. latex when applied by roller coating, impregnation or doctor knife onto paper is used for washable wallpapers and kitchen lining paper. Such compositions are normally plasticized and thickened. A number of latices are used in the preparation of heat seal coatings for paper for example polystyrene latex plasticized with dibutyl phthalate has been suggested for foodstuffs packaging.

**Conclusion**

It is seen that the " plastics " latices are employed in a wide variety of fields, a number outside the plastics industry. With the advent of many new latices in recent years the potentials of such materials are considerable. Future possible applications may include dipping processes and foams. In the United States and in Germany latices using oils instead of water as the continuous media are available to a limited extent and these too could well increase the range of application.

# Plastics News

Plant and Equipment, Materials, Processes, Company News, Technical Literature, Exhibitions, Personal Notes and Meetings.

**ELECTRO HOT AIR WELDING TOOLS.**—These new tools combine an air turbine driven by a small electric motor with an electric heating element and a jet in one handle.

A constant hot air stream of an adjustable temperature between 180 and 500° C. is produced, simply by connecting the tool to mains supply.

The LK welding tools are therefore easy to handle and transport as they do not require any separate components or hoses. They weigh under 2½ lb. and can be carried in a brief case. The temperature of the air stream can be adjusted from 180° to 500° C.; and the LKS tool (with switch) allows the operator to work with this whole range of temperatures without changing the element. The tools are available in the following forms:

The LKN 250 watt, 260° C.; 350 watt, 400° C.; and 400 watt, 500° C.

The LKE with two exchangeable jets, 250 watt for 180°, 220° and 260° C.; 350 or 400 watt for 350°, 450° and 500° C.

The LKS with switch, 180 or 360 watt for all temperatures, without change of element.

Also available is the LP very light weight Electro Hot Air Pistol, weighing only 12½ oz.

Further details can be obtained from Welwyn Tool Co. Ltd., 2–4 Stonehills House, Stonehills, Welwyn Garden City, Herts.

**TAKE-UP AND WINDING EQUIPMENT.**—A new take-up and winding unit for fine gauges of wire and plastic monofilaments is now manufactured by W. Aumann of Löhne, and distributed by R. H. Cole (Overseas) Ltd., 2 Caxton Street, London, S.W.1.

The unit maintains constant tension on the wire or monofilament irrespective of the diameter of the take-up reel. Torque transmission is by an arrangement of permanent magnets which is free from wear. Take-up bobbins are evenly wound by means of the patented Aumann layer-winding gear. This is normally driven from a fixed speed shaft in the unit, although in special cases it can be synchronized with the speed of the take-up reel.

The equipment can deal with wires or monofilaments of diameters from 0.04 mm. to 1.0 mm. (0.0015 in.–0.039 in.) at speeds ranging from 7.5–150 m/min. (25–492 ft./min.).

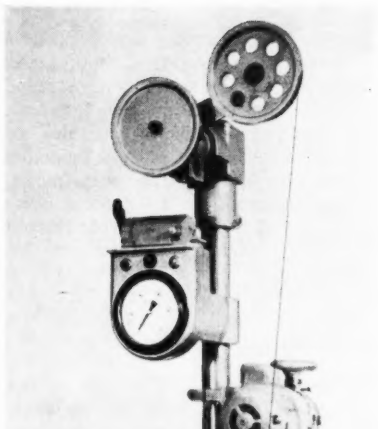
Units can be used singly or in multiple arrangements. In the latter case a central motor drive can be fitted. Special units can be supplied for fitting to existing draw-off equipment.

**PRECISION VACUUM OVEN.**—Griffin & George Ltd., are about to go into production with the Gardiner Precision Vacuum Oven.

This oven was developed in the Research Laboratories of Messrs. Tate & Lyle, during an exacting investigation of the difficulties of drying such labile products as sugar syrups and molasses containing fructose.

In the Gardiner Oven the sample is taken into solution and distributed over an aluminium powder extender contained in a sample dish. It is then heated under vacuum, while a current of air or inert gas, dried to a water content not exceeding 0.0007 mg/l, is bled over its surface.

It is believed that the use of this unique design of vacuum oven will introduce into "moisture" determinations a new order of precision. The first production batch is expected to be available for delivery in April/May, of this year.



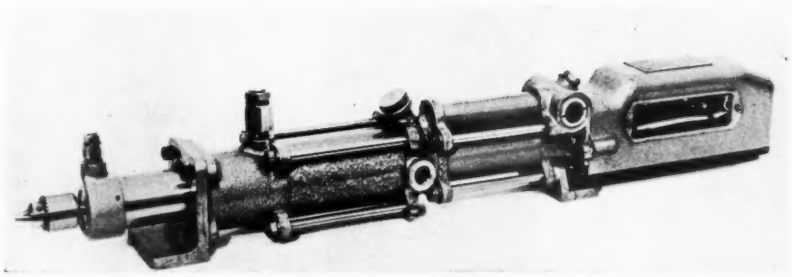
A single unit monofilament take-up and winding stand available from R. H. Cole (Overseas) Ltd.

## General

**Automatic Drill Unit.**—The Maxam Woodpecker Drill Unit newly introduced and now in full production by Climax Rock Drill &

Electro hot air welding gun distributed by the Welwyn Tool Co. Ltd.

The Gardiner vacuum oven manufactured by Griffin & George Ltd.



Maxam drill unit with hydraulic feed control, automatic chip clearance, and rapid sensing approach.

Engineering Works Ltd., Carn Brea, Cornwall, has been designed to speed up drilling operations very considerably. This air-operated 3/16 drill unit incorporates hydraulic feed control, automatic chip clearance by means of its automatic peck action, and a rapid sensing approach.

The forward feed speed is infinitely variable by hydraulic control and the unit will drill to a preset depth against a positive stop and then return to the starting point.

In operation the drill unit advances rapidly until the work is contacted and then commences drilling at the preset controlled rate of feed, automatically retracts, thereby clearing chips from the hole and drill flutes, and immediately re-advances rapidly until the drill contacts the bottom of the hole being drilled and again drilling continues at the controlled rate of feed.

**Correction.**—On page 22 of the January issue the caption to the photographs at the bottom of the page referred to Industrial Appliances Ltd. This was incorrect and should have read Industrial Plastics Ltd.

**Plastics Materials in Hungary.**—An artificial material called Danamid which can be used for fishing lines, gears or ball-bearings is being tested in Hungary.

The material is said to wear well and have great tensile strength as well as resisting chemical action. When exposed to flame it tends to melt rather than burn, says the newspaper *Népszabadság*.

The Plastic Research Institute in Budapest has also made a Polyester which can be used for sticking metal, china and glass and has excellent insulating properties, reports the newspaper. The material is being used in the Klement Gottwald Electrical Factory. Hungary claims to be the first east European country to manufacture this material.

**New Intermediates for Urethane Polymers.**—A new series of polyol polyethers has just been introduced by Union Carbide Chemicals Company, Division of Union Carbide Corporation. These polyethers make it possible for urethane manufacturers to prepare a broad range of prepolymers to meet the most exacting requirements for flexible foams.

These new intermediates for the urethane industry are propylene oxide addition products of 1, 2, 6, hexanetriol, trade-marked Niax. Four polyethers, varying in hydroxyl number from 42 to 240, corresponding to molecular weights from 4,000 to 700, are available.

**Linear Accelerator for Research Station.**—A 4-million electron-volt linear accelerator has been ordered by British Petroleum Limited for their research station at Sunbury-on-Thames, Middlesex.

Design and construction of the accelerator and its associated control equipment are being undertaken by Mullard Research Laboratories on behalf of Phillips Electrical Limited, the contractors.

**New Filler.**—Joseph Crosfield & Sons Ltd., Warrington, Lancs., have introduced an aluminium silicate, Alusil, which, although of similar millimicron particle size and characteristics to Microcal, will be preferred in many applications.

Alusil is the first aluminium silicate of U.K. manufacture to become commercially available.

**Young People's Lecture.** — The Fourth Lecture of the Plastics Institute for Young People was given in the William Beveridge Hall of London University on January 2, and was attended by a record number of 400 boys and girls, some of them accompanied by their teachers, parents or works' training officers.

Professor C. E. H. Bawn, C.B.E., B.Sc., Ph.D., F.R.S., who has been the Grant-Brunner Professor of Inorganic and Physical Chemistry in the University of Liverpool since 1948, chose as his subject "The Progress of Plastics." This was a happy choice, following previous lectures in this series entitled "The Wonders of Plastics," "Working with Plastics" and "Plastics and the Engineer."

**Polystyrene Monofilament for Weaving.**—Shalon weaving grade has been developed by Bakelite Limited for the basket weaving industry. The Shalon weaving grade is available in continuous lengths with variation in gauge no greater than $\pm$ 10% of nominal. It has a smooth non-porous surface, which allows increased weaving speed without discomfort to weavers and permits easy cleaning of the finished article. Due to the uniformity of the product and long lengths available, raw material wastage is negligible.

The Shalon is available in 20 lb. coils, 13½ in. mean diameter in one continuous length. Footage per lb. is approximately 345 ft. Cross sectional in the form of an oval approximately 0.055 in. $\times$ 0.125 in.

**Anti-Dumping Order for Silicone Fluids.**—The Board of Trade have had under investigation an application made by the United Kingdom manufacturers of silicones for the imposition of an anti-dumping duty on polymethylsiloxane fluids and emulsions (commonly known as silicone fluids and emulsions) imported from France. The circumstances have been fully examined and the Board of Trade are satisfied that dumping has been taking place and, in the case of fluids, is still continuing, and that such dumping is causing material injury to a United Kingdom industry.

The Board have, therefore, made an order The Anti-Dumping No. 1 Order, 1958, under the Customs Duties (Dumping and Subsidies) Act, 1957, imposing an anti-dumping duty of 4s. per lb. on polymethylsiloxane fluids originating in France and manufactured by the firm known as Societe des Usines Chimiques Rhone-Poulenc in order to offset the dumping of these goods in the United Kingdom.

**Polythene for Outdoor Use.**—A polyethylene plastic to be specifically compounded with an ultravoilet inhibitor for use in moulding or extruding outdoor products has just been introduced. This polyethylene compound, in natural or colours, incorporates a newly-developed ultraviolet inhibitor. It will last two to four times longer outdoors than polyethylenes that contain no inhibitors to protect them from the sun. A new Tenite polyethylene formulation, the compound is now available in commercial quantities from Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Company, Kingsport, Tennessee.

## *Company News*

**B X Plastics Ltd.** have opened a Midlands depot and office at Pensnett Trading Estate, Kingswinford, Brierley Hill, Staffs. Telephone: Kingswinford 3551.

**David Bridge & Co. Ltd.**—Trading results for the year ended September 30, 1957, showed a balance of £388,007 with a net profit figure of £67,943. A final dividend of 17½% is recommended.

**Pulsometer.**—The London office of the Pulsometer Group has moved to Pulsometer House, 20/26 Lambs Conduit Street, London, W.C.1. Telephone: Holborn 1402.

**Retigraph Ltd.** have moved their plastics and printing works and head office to 188 Rye Lane, Peckham, London, S.E.1. Telephone No., New Cross 6789.

**Shell Synthetic Rubber Plant.**—A synthetic rubber plant with an initial capacity of at least 50,000 tons per year is to be constructed at Pernis, near Rotterdam, Holland, for Shell Pernis Chemische Fabrieken N.V.

**Permali Ltd.**—The London office of Permali Ltd. is now at Victoria Street, London, S.W.1. It also becomes the London office for the associated companies of Hordern Richmond Ltd., and Hydulignum-Jabroc (Tools) Ltd. The telephone number, ABBey 6494, remains unchanged.

**Elk & Co. Ltd.** have moved to new accommodation at Elkon Works, Down Street Factory Estate, West Molesey, Surrey, where the works and offices will be under one roof. Their London offices and showrooms remain at 237a Kensington High Street, London, W.8.

**British Geon Ltd.**—The telephone number of British Geon Ltd. is now Hyde Park 7321.

**British Industrial Solvents** has announced reductions of £5 per ton in the prices of Bisol dibutyl phthalate and di-isobutyl phthalate, and of £2 10s. 0d. per ton in the prices of its Bisoflex phthalate plasticizers, applying to all sizes of delivery from January 13, 1958.

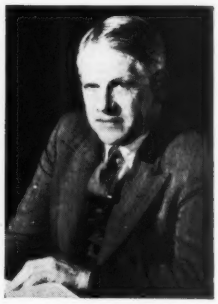
**Durham Raw Materials Limited** and J. M. Huber Limited announce that, as from January 1, 1958, Durham Raw Materials Limited have been appointed distributors in the United Kingdom of materials manufactured by the J. M. Huber Corporation, 100 Park Avenue, New York, 17.

**Price's (Bromborough) Limited** announce the appointment of:—Amel H. Agren A.B., Gothenburg 2, as the selling agents in Sweden for Price's oleines, stearines, fatty acids, and fatty alcohols.

Mr. L. Dobson

Dr. A. W. C. Taylor

Dr. R. G. Heyes



Mr. R. H. Dibb

**British Insulated Callender's Cables Limited** and **The Telegraph Construction and Maintenance Company Limited** announce the formation of Malayan Cables Limited in the Federation of Malaya with an initial authorised capital of five million Malayan dollars (£583,333). A factory is being erected in Kuala Lumpur.

## *Personal*

**Mr. J. Lionel Daniels.**—It is with deep regret that we hear of the untimely death of Mr. J. L. Daniels following a car accident at Ashbourne on January 9. Mr. Daniels, who would have been 51 this month, was managing director of T. H. & J. Daniels Ltd., of Stroud, and a well-known figure in the engineering and plastics world. He was a former President of the British Plastics Federation, and chairman of the Western section of the Institute of Mechanical Engineers.

**Mr. Daniel Alexander Robertson.**—It is with regret we hear of the death of Mr. Daniel Alexander Robertson, Director of Francis Shaw & Co., Ltd., Manchester, who died at his daughter's home Nether Alderley, Cheshire, on Friday, December 27, 1957.

**Mr. A. A. Duncan,** the managing director of the operating companies of the National Plastics Group, has also been appointed managing director of the Parent Company.

**T. H. & J. Daniels Ltd.**—Following the death of Mr. J. Lionel Daniels the following alterations have been made to the Board of T. H. & J. Daniels Ltd. **Mr. F. W. Daniels** has been appointed Chairman of the Company. **Mr. A. O. R. Johnson** has been appointed managing director, and **Mr. F. E. Miller** has been appointed deputy managing director. **Mrs. M. H. Daniels,** widow of the late Chairman, has been elected an additional director of the Company.

**Mr. J. Mathie** has retired from his directorship of O. & M. Kleemann Limited.

**Mr. T. E. Potts** has been appointed a managing director of the British Oxygen Company Limited.

**Mr. R. J. Kingsnorth** has been appointed manager of the Process Control Division of Elliott Brothers (London) Limited, a Member of the Elliott-Automation Group.

**Mr. C. N. Ford,** Works Manager and **Mr. S. H. A. Hirsch,** Technical Sales Manager have been appointed to the Board of Vinyl Products Ltd.

**Mr. E. Pearson** has been appointed assistant sales manager of Fielden Electronics Limited. **Mr. G. Ensor,** General Manager of the Company, has now resumed the office of Sales Manager in addition to his other duties.

**Changes in Division Management at I.C.I.**—With the transfer of polythene from the Alkali Division to the Plastics Division, changes to the Plastics Division Board have been announced. The following appointments have been made:

**Mr. L. Dobson** has relinquished his appointment as an Alkali Division Director on December 31, and becomes a full-time Director of the Plastics Division. **Dr. A. W. C. Taylor,** Billingham Division, has been appointed Technical Director of the Plastics Division. **Dr. R. G. Heyes,** Plastics Division Personnel Director, will also assume responsibility for production in that Division. **Mr. R. H. Dibb,** Plastics Division Engineering Director, will succeed Mr. J. E. Braham as I.C.I. Engineering Controller on the latter's retirement on September 30 next, and Mr. L. Dobson will then become Engineering Director of the Plastics Division.

**Mr. Percy Smith** has been appointed a director of Bakelite Ltd. Mr. Smith was previously General Sales Manager and his appointment fills the casual vacancy caused by the resignation of Mr. C. C. Last reported last month.

**Mr. R. A. Sawtell** has been appointed Distribution Manager of the Chemical Division of the Distillers Co. Ltd.

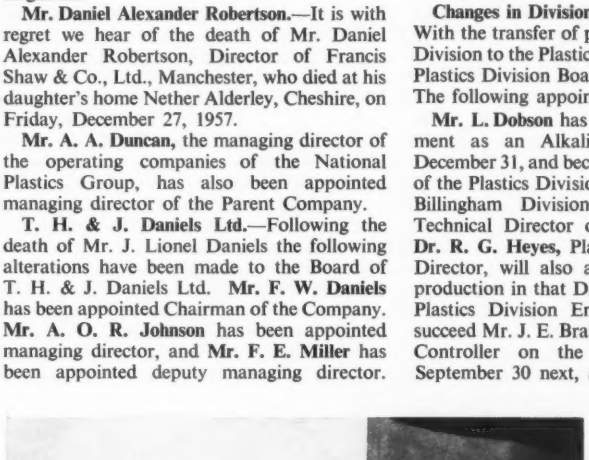
**Dr. W. D. Scott** has been appointed Assistant Managing Director of BTR Industries Ltd.

**Mr. C. S. Dingley.**—At a recent meeting of the Trustees of the Plastics Industry Education Fund Mr. C. S. Dingley was re-elected Chairman until the end of 1958, and **Mr. S. P. Thompson** reappointed as Secretary. Following his election last July as President of the Plastics Institute, Mr. J. C. Swallow became ex-officio a Trustee of the Fund.

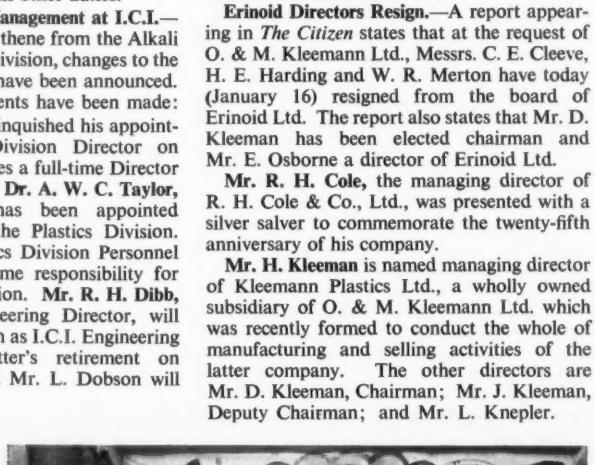
**Erinoid Directors Resign.**—A report appearing in *The Citizen* states that at the request of O. & M. Kleemann Ltd., Messrs. C. E. Cleeve, H. E. Harding and W. R. Merton have today (January 16) resigned from the board of Erinoid Ltd. The report also states that Mr. D. Kleeman has been elected chairman and Mr. E. Osborne a director of Erinoid Ltd.

**Mr. R. H. Cole,** the managing director of R. H. Cole & Co., Ltd., was presented with a silver salver to commemorate the twenty-fifth anniversary of his company.

**Mr. H. Kleeman** is named managing director of Kleemann Plastics Ltd., a wholly owned subsidiary of O. & M. Kleemann Ltd. which was recently formed to conduct the whole of manufacturing and selling activities of the latter company. The other directors are Mr. D. Kleeman, Chairman; Mr. J. Kleeman, Deputy Chairman; and Mr. L. Knepler.



Mr. Keith Leigh, Managing Director, Steelweld Pty. Ltd., Mr. L. Reichstein, Chairman of Directors, Industrial Engineering Ltd., Mr. R. E. G. Windsor, Chairman & Managing Director, R. H. Windsor (Aust.) Pty. Ltd., Mr. L. Scharp, Partner, Fuller King & Co., & R. H. Windsor (Aust.) Pty. Ltd., Mr. L. P. Jensen, Director, R. H. Windsor (Aust.) Pty. Ltd., Mr. L. J. Herman, Sales Director, R. H. Windsor (Aust.) Pty. Ltd.



Mr. E. K. Cole ,Chairman and Managing Director of E. K. Cole Ltd., after presenting gold watches to seven employees of Ekco Plastics who had completed 25 years service.

Mr. P. Steer

Mr. E. G. Lennard

Mr. G. W. Hemy

Mr. A. J. Perryman

**Mr. H. R. Whyte** has been appointed Technical Director and **Mr. C. E. D. Catley** has been appointed Works Director of Hellermann Ltd. Other appointments are **Mr. S. E. Downer** as Manager of the Cable Accessories Division, **Mr. P. Steer** as Manager of the Plastics Extrusion Division, and **Mr. P. Bowthorpe** as Assistant Sales Manager.

**Mr. S. H. A. Hirsch** and **Mr. C. N. Ford** have been appointed to the Board of Vinyl Products Limited of Carshalton, Surrey, a subsidiary of Reichhold Chemicals Ltd.

**Mr. Kenneth McGregor.**—The Board of Trade announce the appointment of Mr. Kenneth McGregor, C.M.G., an Under-Secretary in their Industries and Manufactures Department, as the United Kingdom Senior Trade Commissioner and Economic Adviser to the High Commissioner in Canada in succession to Mr. Gordon Bowen, C.M.G., who will return to the Headquarters of the Board on completion of his tour of duty.

**Dr. H. P. Zade** has been elected to the Board of Rediweld Limited as one of the directors.

**Mr. W. A. C. McIntyre,** formerly Technical Sales Manager of Fielding & Platt Limited of Gloucester, has joined Reed Brothers as a Director. Mr. McIntyre will be chiefly responsible for the expansion of the manufacturing programme of hydraulic presses of all types, made possible by the completion of a new and larger works and machine shop at Woolwich.

**Mr. H. Finlay,** who has been closely associated with the polythene packaging industry for many years, and was until recently with Spesco Developments Limited, has taken up his appointment with the Sales Division of Anglo-American Plastics Limited.

**Mr. G. W. Hemy** has been appointed Chemical Sales Director of Joseph Crosfield & Sons Limited, Warrington, in succession to Mr. A. C. H. Cairns.

**New Appointments in the Simms Group.**—The following appointments are announced in the Simms Group of Companies.

**Mr. M. A. Hassid,** a Director of Simms, joins the board of Clearex Products Ltd. **Mr. A. H. Tranter,** Managing Director of Clearex Products, becomes a director of Lester Plastics Ltd., and of The Thompson Mfg. Co., Ltd. **Mr. F. J. Dellow,** Secretary and Chief Accountant of Clearex Products, has been appointed Secretary and Chief Accountant of Lester Plastics and The Thompson Mfg. Co.

**Mr. W. J. Worboys,** Chairman of the Council of Industrial Design and a Director of Imperial Chemical Industries Ltd., was awarded a knighthood in the New Year's Honours List.

**Mr. A. J. Perryman** has been appointed sole Managing Director of Catalin Limited, manufacturers of industrial resins, of Waltham Abbey, Essex. Previously Mr. Perryman was joint Managing Director with Mr. J. E. Currie. Mr. Currie remains as Chairman.

**Mr. E. W. Mathias, Mr. A. W. Chambers, Jr.,** and **Mr. R. Perry,** have been promoted to administrative positions at Hooker Electrochemical Co., Niagara Falls, N.Y., Mr. Mathias has been appointed assistant treasurer, Mr. Chambers named assistant secretary and associate counsel, and Mr. Perry made assistant comptroller.

**Mr. E. G. Lennard,** who joined Pena Industries Ltd. (then the Pena Copper Mines) as Export Sales Manager on October 1, 1957, has now been appointed Managing Director of the Penco Export Company Limited, a new subsidiary of The Pena Group. This Company will undertake Pena's increasing volume of exports, particularly in electronics, plastics and special steels.

**Mr. D. I. Shakespeare,** Sales Manager (Domestic Division), of Creators Ltd., of Woking, Surrey, since 1955, has resigned in order to join Stewart Plastics Ltd., of Croydon, as Home Sales Manager. Mr. Shakespeare will take up his new appointment during February.

**Mr. R. Rooke.**—Barrow Hepburn & Gale Ltd. announce the appointment of Mr. R. Rooke as Chief Technical Adviser on conveyor belting and installations.

## *Meetings*

**February**

**18th.**—" Plastics Machinery," by O. F. Bartoo. The London Section of the Plastics Institute, Wellcome Building, 183–193 Euston Road, London, N.W.1. 6.30 p.m.

**19th.**—" Recent Developments in Polythene," by H. A. Rigby. The North-Eastern Section of the Plastics Institute, the Second Dining Room of the Eldon Grill, Grey Street, Newcastle. 7 p.m.

**20th.**—" The Use of Plastics in Protective Packaging," by F. A. Paine. A joint meeting of the Western Section of the Plastics Institute with the Society of the Chemical Industry, at Gloucester. 7 p.m.

**21st.**—" Industrial Designs for Plastics," by A. H. Woodfull. The Midlands Section of the Plastics Institute, the James Watt Memorial Institute, Great Charles Street, Birmingham, 3. 6.30 p.m.

**25th.**—" Design of Fabrics for Plastic Coating," by E. Butterworth. Joint meeting of the Scottish Sections of the Plastics Institute and the Textile Institute, the St. Enoch Hotel, Glasgow. 7.30 p.m.

**27th.**—" Recent Advances in Polymer Technology," a joint conference of the Plastics Institute with the Institution of the Rubber Industry at the Institution of Civil Engineers, Great George Street, Westminster, S.W.1.

**28th.**—" Injection Moulding of Nylon and its Influence on Plant Design," by T. W. Currie. The North-Western Section of the Plastics Institute, the Engineers' Club, Albert Square, Manchester. 6.45 p.m.

**March**

**12th.**—" New Developments in Injection Moulding," by E. Gaspar. The South Wales and Monmouthshire Section of the Plastics Institute, Angel Hotel, Cardiff. 7 p.m.

**12th.**—J. J. Newland. A joint meeting of the Western Section of the Plastics Institute with the West of England Section of the Institution of the Rubber Industry, at Bath. 7.30 p.m.

**12th.**—" The Impact of Synthetic Fibres on Industry," by Prof. J. B. Speakman. The Yorkshire Section of the Plastics Institute, St. Marks House, 186 Woodhouse Lane, Leeds.

**13th.**—" Plastics in Conveyor Belting, with special reference to the Mines," by C. G. Addingley. The Ninth Annual Lecture of the Plastics Institute, in the large Chemistry Hall, Leeds University, Leeds. 6.30 p.m.

**13th.**—Visit to the works of the Clyde Paper Co., Ltd., Rutherglen, by the Scottish Section of the Plastics Institute.

**" Plastics in the Service of Man "**

The following is a list of full names and addresses of companies mentioned in the illustrated feature, " Plastics in the Service of Man," which appears on pages 48 to 50 in this issue:—

**75. " Plastics at the Boat Show "**

Aero Research Ltd., Duxford, Cambridge.

B.I.P. Chemicals Ltd., Popes Lane, Oldbury, nr. Birmingham.

Graham Bunn (Wroxham) Ltd., Windboat Works, Wroxham, Norfolk Broads.

Cellon Ltd., Kingston-on-Thames, Surrey.

Halmatic Ltd., Rodney Road, Portsmouth, Hampshire.

G. Hunter (London) Ltd., Yacht Division, 80 Fenchurch Street, London, E.C.3.

R.F.D. Co. Ltd., Godalming, Surrey.

Reeves & Sons Ltd., Lincoln Road, Enfield, Middlesex.

W. & J. Tod Ltd., Ferrybridge, Weymouth, Dorset.

Tufnol Ltd., Perry Barr, Birmingham, 22B.

Samuel White Group, Golden Cross House, 3/8 Duncannon Street, London, W.C.2.

Willerby Plastics, Main Street, Willerby, nr. Hull, E. Yorkshire.

Wright & Sons (Ipswich) Ltd., Cullingham Road, Ipswich, Suffolk.

# Automation Equipment

**Multelec Recorder.**—It is announced by George Kent Ltd. that their Mark 2A electronic Multelec recorder, developed for and previously reserved for sale to the atomic-energy industries, is now made generally available to all industries.

Its applications are as follows: temperature measurement (thermocouple or resistance thermometer); direct millivoltage recording; for industrial measurements depending on a radioactive source and ionization gauge, such as of level, material thickness, density, etc.; and for research work.

This instrument has been designed primarily as a single-point indicating recorder, enabling measurement to be made at high speed. Three different types of built-in amplifier are available, the type used depending on the application.

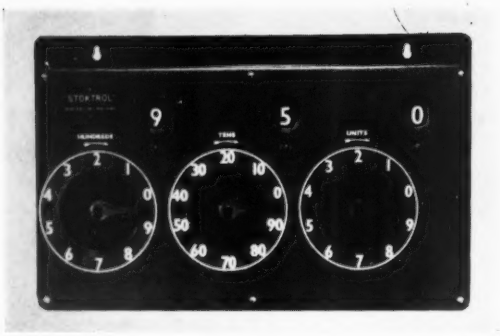
The illustration below shows the instrument with the door and main frame in the open position. The pendriving motor is mounted on the main frame below the slidewire, and at bottom left can be seen the reference unit, at bottom centre the amplifier and synchronous converter, and at top centre the standard cell. These three units are mounted in the back of the instrument case.

*George Kent Ltd., Luton, Beds.*

**Stock Controller.**—One of the simplest ways of keeping a check on stocks of items which are constantly drawn upon is provided by the Stoktrol. This is, in effect, a subtracting machine.

The standard machine has three large dials. The stock in hand is shown on three oval " windows " at the top of the machine. As stock is issued, the quantity is " dialled " by a stylus on the three dials (for hundreds, tens and units, respectively). Remaining stock is shown in the windows.

Apart from stock control, the machine has other uses. It could be used for batch counting, for example. As items pass along the production line, a figure would be dialled, and the result would show how many more items would be needed to make up a particular batch.




The Stoktrol recording instrument for production, batch or stock calculations.

Similarly, in production control, the target figure could be shown. As production proceeds, the numbers would be dialled, thus showing the balance required at any particular time.

The machine is fully automatic, and no mental calculations of any kind are involved. No skill, of course, is required to operate it.

Capacity of the Stoktrol is 1,000. Models can be produced to deal with higher figures. The machine can also be supplied to add instead of subtract. It is black, with dials and numerals in white, to ensure speedy reading.

*K. Bisset & Co., Ltd., 145 Grand Buildings, Trafalgar Square, London, W.C.2.*

**Dewpoint Meter.**—A precision instrument for the measurement of water vapour density and water vapour pressure, proportion of water vapour by volume and dewpoints, is now being manufactured under contract in this country by C. F. Casella & Co. The instrument is suitable for testing in many chemical manufacturing processes, plastics manufacture, air-conditioning and refrigeration installations.

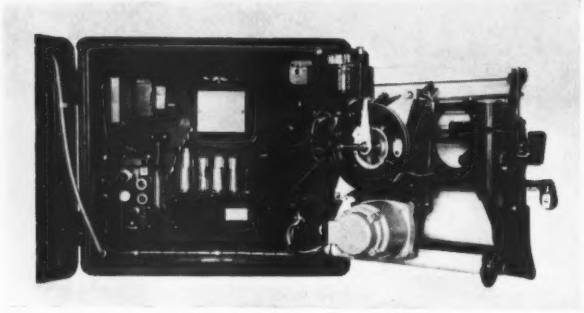
Called the Alnor Dewpoint Meter, this is a portable, self-contained instrument, manually operated and designed for the measurement of the water vapour content of air or any other gas which has a dewpoint within the range –80° F. to room temperature. It was developed originally by the Illinois Testing Laboratories Inc., of Chicago, for the testing of gases that are relatively dry and therefore within the dewpoint range where most other methods of measurement become difficult or impossible.

The apparatus operates on the well-known principle that if a gas is compressed and the pressure released, the consequent expansion results in a cooling effect. If the expansion is sudden, adiabatic conditions are approached so that the final temperature can be calculated. If the pressure used is such that the gas when expanded cools to a temperature at which the water vapour present begins to separate out as a fog or dew, then this temperature is the dewpoint.

By means of a built-in hand pump, a sample of the gas is drawn into the instrument and held in the observation chamber above atmospheric pressure. The temperature of the gas is then read and the pressure quickly released by depressing the operating valve. This also switches the lamp on, illuminating the chamber, and if the gas has cooled to dewpoint due to its rapid expansion, a fog will be observed through the window. Even where there are " no dust " conditions the radium foil incorporated produces ions to act as substitute nuclei around which the droplets can form. The actual dewpoint temperature is read from the slide-rule calculator which gives the relationship between initial temperature, pressure ratio and dewpoint for the various Q values.

The instrument improves on others in this field by eliminating imprecise methods of reading and measurement, by making coolants unnecessary, and by enabling readings to be taken away from the source of the gas. It can be used, within its range, for any gas which is non-corrosive to brass or copper. It is claimed that the instrument has been so designed that it can be operated accurately by semi-skilled personnel.

*Electric Resistance Furnace Co., Ltd., Netherby, Queens Road, Weybridge, Surrey.*



(Above) The Mark 2A Multelec recorder.

(Right) The Alnor Dewpoint meter.

# irgalite GREEN YELLOW 6GS

ANOTHER NEW DEVELOPMENT BY

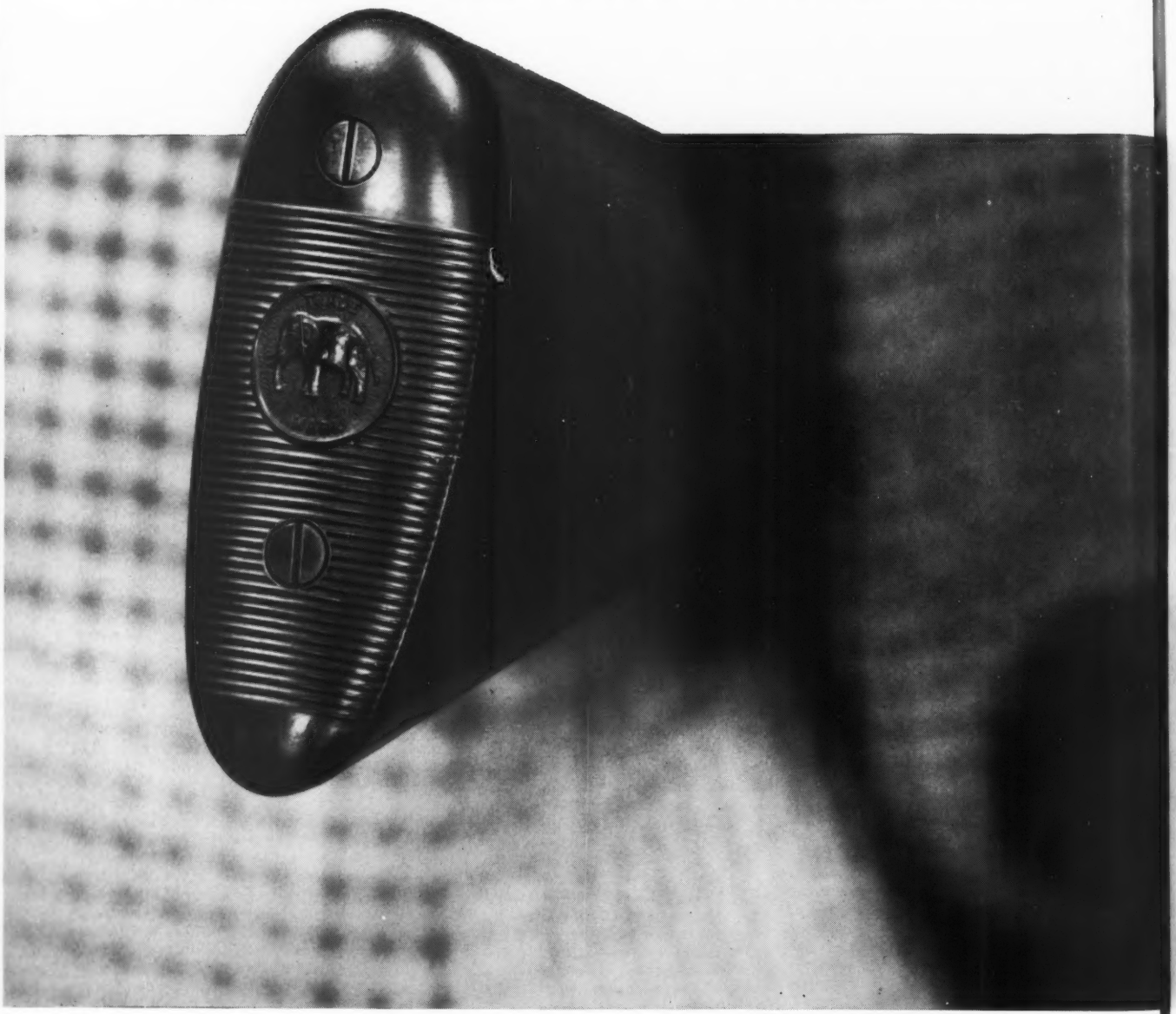
# GEIGY

A new metal complex organic pigment for all types of plastics and rubbers. Irgalite Green Yellow 6GS can be used to produce a range of contemporary yellows and greens characterised by extreme fastness to light and heat. *Non-bleeding, non-chalking* and *rub fast.*

THE GEIGY COMPANY LTD., Rhodes, Middleton, MANCHESTER.

P42

# MOULDED IN LUSTREX FOR TOUGHNESS



*Gun butt plate moulded in Lustrex T-11 for W. W. Greener Limited by Studio Plastic and Metal Components Ltd.*

Lustrex polystyrene has grades for every purpose:

**For toughness**—and extra-toughness . . . Lustrex Toughened 3 and Toughened 11.

**For vacuum-forming**—Lustrex Toughened 6 for sheet extrusion.

**For intricate mouldings**—specially those needing a long flow . . . Lustrex Hi-Flow 55.

**For dry colouring**—to any shade you require . . . Lustrex Colourant Blend.

**For almost any job in polystyrene** . . . Lustrex General Purpose.

*Lustrex is a Registered Trade Mark.*

Monsanto Regd.

**MONSANTO PLASTICS LIMITED,**

**411 Monsanto House, Victoria Street, London, S.W.1 and at Royal Exchange, Manchester, 2.**

*In association with: Monsanto Chemical Company, St. Louis, U.S.A. Monsanto Canada Limited, Montreal. Monsanto Chemicals (Australia) Ltd., Melbourne. Monsanto Chemicals of India Private Ltd., Bombay. Representatives in the world's principal cities.*

# The Boston Universal Take-off Machine

THIS machine, manufactured by the Boston Marine & General Engineering Co., Ltd., Leeds, has been primarily developed to overcome the many limitations of the taper roller type Take-off machines as generally used.

For that reason the machine has been designed on the belt traction principle, the obvious advantages of this being that a powerful non-slip grip over a wide area of contact is obtained. This is achieved by sandwiching the profiles between resilient pads mounted on two belts running at identical speeds. Due to the high coefficient of friction of the pads used there is only a very light contact pressure and consequently no distortion can take place; thus extremely thin walled sections can be taken off successfully. This also means that apart from tubes the machine will also take off irregular sections of all shapes and types.

In conjunction with the very smooth constant speed drive the above features eliminate "rippling" and "spiralling."

The upper and lower conveyors can be easily adjusted by unskilled labour for all diameters and profiles to give a straight line pull at die head level. Tubes from 0 in. to 10 in. diameter can be handled. The fact that both conveyors are driven, doubles the available pull, for the same contact pressure.

To obtain uniform grip and support along the length of the conveyor the belts are run over a large number of closely spaced ball-bearing rollers obviating sag and reducing friction. It is a very simple matter to change belts as the single column type of construction has been used.

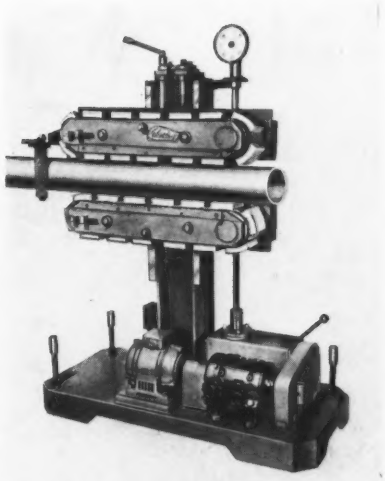
Whilst the standard type of belt will meet most requirements, special purpose belts can be supplied and fitted in a matter of minutes. The tension of the belts is achieved by increasing the centre distance between the belt pulleys. The standard belts are 6 in. wide and the nominal centre distance between the driving and the driven pulley is 30 in. The speed of the belts can be infinitely varied from 6 in. per minute to upwards of 50 ft. per minute. This wide range can be modified for non-standard applications. A speed indicator with a 6 inch dial is fitted.

One of the useful features of the machine is the very small floor space required, the base measuring only 53 in. × 24 in. and the overall height being approximately 6 ft. The machine is of robust construction and weighs approximately 14 cwt. When supplied with castors, the machine can easily be moved from one extruder line to another. The base plate supports the main column and the infinitely variable speed gear driving through a two-speed gearbox a vertical shaft which in turn drives the pulleys through suitably mounted worm boxes.

The standard model "A" is driven by a three-phase squirrel cage motor and a hydraulic speed transformer of excellent speed holding characteristics, the speed being accurately adjustable. Where it is desired to control the speed from a distance, a small three-phase servo motor is energized by a remote "slow-fast" two station push button. Alternatively, more ambitious control schemes can be used on the electronic model "B."

The electronic drive consists of:—

(1) A variable speed direct current shunt wound motor, of fixed field strength, with a maximum speed of 1,400 r.p.m. At the non-driving end of the motor a permanent magnet type of A.C. generator is built as an integral part of the machine, the voltage from it being directly proportional to speed.



The belt traction system is seen clearly in this photo.

(2) An electronic rectifier unit operating on normal *single* phase A.C. mains supplying the direct current for the motor. The unit employs mercury vapour grid controlled thyratrons and is housed in a sheet steel case.

(3) A small control box constructed in sheet steel, housing an on-off switch and also a speed regulating potentiometer. This unit can be mounted anywhere.

This latter type of drive can readily give fairly accurate indication of the pull exerted.

On some applications constant pull rather than constant speed is required and this can easily be obtained in the electronic model without resorting to slipping clutches and similar devices. Furthermore, it is possible to switch over from constant speed to constant tension by turning a switch.

Full information is available from the company at Viceroy Works, Low Fields Road, Leeds, 12.

# Book Reviews

**Paint Trade Manual**

*By H. W. Chatfield.* 282 *pp.*

*Distributed by Scott Greenwood & Son, Ltd. Price* 24*s.*

Dr. Chatfield is one of the paint industry's authorities, and this book "Paint Trade Manual" has been the standard work since it was first published. The new edition is even more comprehensive than its predecessor and contains a wealth of valuable information, from names and addresses of research associations to a schedule of specifications, embracing on the way an inventory of raw materials, etc.

**International Plastics Directory**

1,056 *pp.*

*Published by Verlag für Internationale Wirtschafts Literatur G.m.b.H. Zurich.*

To every growing industry there comes a point in time where an international directory of names and addresses becomes essential. The directory under review is an ambitious attempt to meet an obvious need and as an exercise in documentation technique the compilers will be rightly proud of their work. The fault, if it can be so considered, lies in trying to achieve too much, for even with a 1,000 pages at hand, there is a limit to the amount of text that can be squeezed in. The result is a somewhat patchy product and, like the curate's egg, good in parts.

The directory is in two main sections, the first comprising names and addresses of materials, manufacturers, the second moulders and fabricators. Manufacturers of machinery are not listed. The method of classification is by country, subdivided by towns in each country. The classification has thus been approached geographically rather than by process or material, which makes the directory much more useful to people who want to sell *to* the plastics industry than to those who want to buy from it. There is no group classification, world or countrywise, to show which companies extrude or injection mould, but it *is* possible to track down a company in Matarwan, New Jersey, U.S.A., who are custom moulders of electronic components. Some 80 countries are covered, some well and some only fairly well. As a guide, approximately 800 British moulders and fabricators are listed.

The directory also includes addresses of associations, schools, research laboratories, standardizing centres, periodicals, and three vocabularies, German-English-French, English-German-French, and French-German-English. The directory is worth buying for these alone.

The accuracy of what is printed is uniformly good and bringing so much information between two covers, as it does, it will be an essential reference work to all who have export connections.

**Plasticizers.**

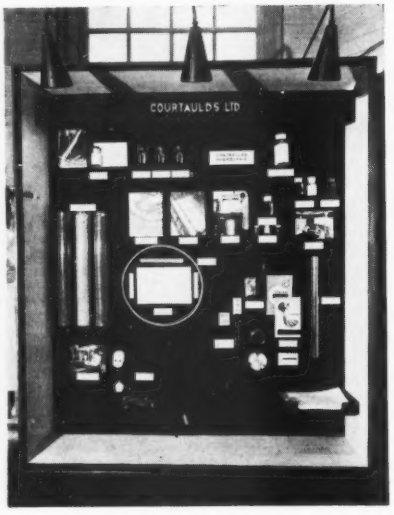
*By D. N. Buttrey.* 213 *pp.*

*Published by Cleave-Hume Press, Ltd. Price* 35*s.*

This is the second edition of the book, first published in 1950. In that time it has become the standard work in its field, and the new edition has not only been brought up to date but has also been enlarged to include new material on hydrocarbon and aromatic extenders, polymeric plasticizers, and many new esters. Intended as a concise guide, the work is enhanced by the addition of numerous literature references. It is therefore valuable not only to works chemists but also to students for whom wide reading is necessary. The subject and table indexes are both good.

# TALKING SHOP . . .

**Careers in Plastics.** My old friend, Alex Meldrum, managing director of Melwood Thermoplastics Ltd., was the spearhead of a group which organized in Harpenden last month an excellent "careers week for plastics." Under the auspices of the Harpenden Rotary Club, and with the help of I.C.I. Plastics Division, Bakelite Ltd., and Courtaulds Ltd., an impressive display of plastics applications




Courtaulds stand at Harpenden.

was staged at the public library. On the opening day, C. W. Welch gave a short address to the Rotary Club luncheon, and Dr. Cyril Child, of I.C.I., spoke to over 100 sixth-formers in the Public Hall in the afternoon. In addition to an excellent talk on plastics and careers in the industry, he showed two films. The children obviously enjoyed it as much as he did.

* * *

**George R. Clarke.** Widely known in the industry as a prodigious worker and a pugnacious golfer, G. R. Clarke left us last month to take up a new position as personal assistant to the managing director of John Dale Ltd. He was advertisement manager of *Plastics* for two years and prior to that was on the advertisement staff of *The Aeroplane*. Regretfully though we parted with him, his friends will be glad to know that he is still largely within the confines of the industry. His successor as advertisement manager is Peter Limbrey, who has been with Temple Press Ltd. for over ten years, the last two of which he has been advertisement manager of *Light Metals*. To both of them we wish success.

* * *

**Fifty Years Old.** The firm of Fraser & Glass started as a metal stamping business in 1908 in Hornsey. There, some years later, they began making the primitive wireless sets of those days and the founder, the late Mr. Fraser, set up a small plant to enable various knobs and other pieces for these sets to be produced in plastics.

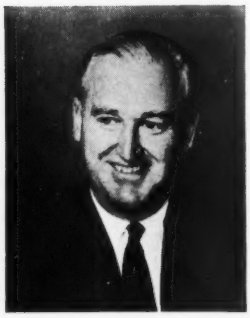
In 1928, Mr. J. S. Walker joined his father-in-law, Mr. Fraser, and in the following year Mr. V. C. Webber took charge of the office, and both are now the present joint managing directors of the company. In 1930, more extensive accommodation was found at North Finchley, and in 1932 a limited company was formed.

In 1957, Fraser & Glass celebrated its 25th anniversary as a limited company and, as the firm first came into being 50 years ago, the directors decided to celebrate this double event by holding a buffet-dance for all its employees in January. It was considered appropriate that this function should be held at the Hornsey Town Hall in the district where Fraser & Glass first came into being.

* * *

**Railway Mania.** The untold legions of people of all ages whose passion is the railway locomotive will be interested to hear of a new book by Peter Allen, the I.C.I. main board director, recently published. Peter Allen, educated at Harrow and Trinity College, Oxford, has been fascinated by trains since his boyhood. The far-flung interests of the I.C.I. organization now take him to all parts of the world, and in the intervals of business he always contrives to note and photograph the steam locomotive, still working faithfully in its manifold forms and in many remote places.

"On The Old Lines," as the new book is entitled, is to a great extent a picture-book, with photographs on every right-hand page and informal talk and reminiscence on every



(Right) Peter Allen, I.C.I. main board director, has added a new work to the Literature on trains.

left. The European section is especially rich on Spain, where many endearingly antiquated machines still survive. Mr. Allen has a gift for conveying not just the character of the locomotives, but the atmosphere of the railway itself, and his pages are illumined with curious pieces of information, such as that of a locomotive in Western Australia needs as much water as 17,000 sheep, and why Peruvian peasants wear trilby hats.

* * *

**London Section Dinner and Dance.** A new record was set up on January 17 when well over 300 members, wives and friends attended the annual dinner and dance of the London Section. The chairman for the 1957–58 session, Mr. C. W. Welch, assistant editor of *Plastics*, and his wife, received the guests in the anteroom to the Victoria Hall of the Criterion. Guests at his table included Mr. E. N. Adlington, deputy managing director of Temple Press Ltd., proprietors of *Plastics*, and Mrs. Adlington, Dr. N. J. L. Megson, of the Royal Aircraft Establishment, Farnborough, and Mrs. Megson, Mr. P. K. Jennens, director, Temple Press Ltd., and Mrs. Jennens, and Mr. M. D. Curwen, editor of *Plastics*, and Mrs. Curwen.

The Master of Ceremonies, Anthony Merriam, not only piloted the proceedings of the evening with tremendous success but also undertook all the preparatory work. He was responsible for the excellent arrangements, including the dinner. The Tombola achieved a success far surpassing the hopes of the committee, due entirely to the efforts of Bill Marmion and Mr. and Mrs. John Winstone.

Some of the London Section members were photographed during the reception, and a pictorial record of this most successful function is given on the facing page.

PLASTIKON.

V. C. Webber.

J. S. Walker.

G. R. Clarke.

P. Limbrey.

# Institute Dinner and Dance—1958

(Above) Mr. and Mrs. M. D. Curwen and Mr. and Mrs. C. W. Welch. (Left) Mr. and Mrs. Vincent Cohen.

(Above) Mr. E. C. W. Huson.

(Above) Mr. and Mrs. David Crabtree.

(Left) Mr. and Mrs. Arnold Sherwood.

(Above) Mr. and Mrs. P. K. Jennens.

(Left) Mr. and Mrs. Clifford Todd.

(Above) Mr. and Mrs. Charles Oakhill.

(Left) Mr. and Mrs. Percy Smith.

(Left) Mr. and Mrs. E. N. Adlington.

(Above) Dr. and Mrs. N. J. L. Megson.

(Left) Mr. and Mrs. Alan Duncan.

(Above) Mr. and Mrs. L. E. Whitmore.

(Left) Mr. and Mrs. E. C. Whitfield.

# The Use of Thermoplastic Materials in the Construction of Acid-Resistant Plant

By H. P. ZADE*

IN the course of the last decade many uses have been found for thermoplastic materials. This applies to injection moulding of comparatively small articles in polythene, polystyrene and other thermoplastics; it also applies to the fabrication by welding of items used in the chemical industry.

Typical examples are the lining of tanks and the construction of pipelines preferably in polythene or rigid p.v.c. The excellent resistance of these materials to acids in liquid form and acid

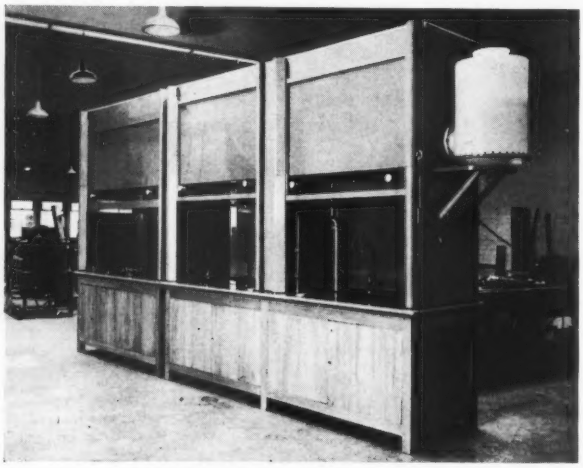


Fig. 1. Large fume cupboards fabricated from rigid p.v.c.

fumes makes them a particularly interesting proposition for such work.

One drawback of these materials is their low physical strength, and this is the reason why larger structures have, up to now, seldom been made in thermoplastics. For instance, laboratory fume cupboards, which in some cases perforce must be of considerable physical size, have hitherto been made in more conventional materials or have been made of steel or timber and subsequently lined with plastics. By using a somewhat different fabricating technique it is possible to make self-supporting structures in rigid p.v.c. which will permit the construction of fume cupboards up to considerable sizes. The illustrations (Figs. 1 and 2) show a number of these rigid p.v.c. fume cupboards, and it might be of interest to describe in detail the method of construction and the special features incorporated in these units.

The smaller unit, which consists of a timber base and a p.v.c. superstructure, measures 6 ft. across $\times$ 10 ft. high $\times$ 3 ft. deep, and is fitted with a sliding transparent Perspex window counterbalanced with lead weights which run inside special pre-formed p.v.c. sections. These formed sections give the structure its rigidity.

The sinks are made in the following way: on the left-hand side, steel is used for the construction of the sink, which has been lined with epoxy resin by spraying, since it has to carry liquid with a temperature of 90° C. Six quartz immersion heaters produce the required heat, and a thermostat is incorporated to keep the temperature constant.

The sink on the right-hand side is a timber construction lined with p.v.c. sheet. In order to obtain sufficient light inside the cupboard, Perspex windows have been incorporated (welded in) on the left-hand and right-hand faces, to allow the fitting of fluorescent lights (strip lights). These illuminate the interior of the cupboard (not shown in the illustration).

In view of the fact that a rather high temperature is normal in the epoxy-lined steel tank, the ceiling of the cupboard is artificially cooled, and this has been achieved by incorporating the fume washing unit in the top section of the cupboard. In other words, the fumes are passed through a slot in the top section, which is at right angles to the front elevation, and are then washed by means of a water spray. This spray runs back on to the ceiling so that the p.v.c. sheet, which is subjected to the action of fumes at elevated temperature, is cooled and does not distort.

The larger twin unit on the right-hand side is fitted with a

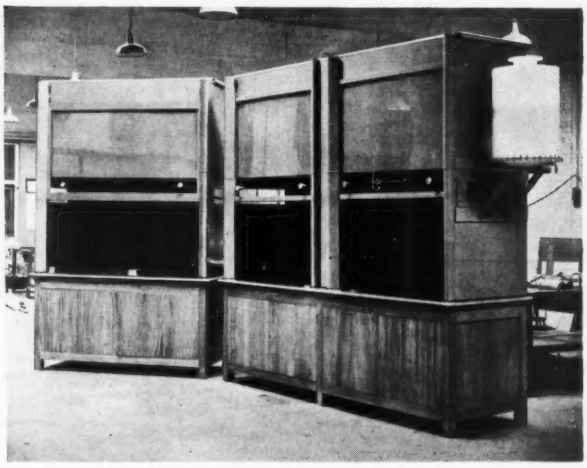


Fig. 2. Many plastics materials are used in these structures, including p.v.c., epoxy, and Perspex.

p.v.c. tank in the centre section, which has been fitted with two quartz heaters and a thermostat. Water circulation is effected by means of a small polythene pump in the base of the cupboard, which circulates the heated water through two tanks keeping the temperature inside the tanks at 30° C. $\pm$ 1°. Further wash tanks are provided, and in this instance, in view of the fairly low temperature, p.v.c. lining of timber sinks has been carried out throughout.

The twin unit has a fume exhaust system which is served by slots in each compartment collecting the fumes towards the right-hand face, and a polythene fume washer which is shown on the right-hand side caters for the washing of the fumes prior to discharge into the p.v.c. ducting and p.v.c. fan. The spray nozzle is visible on the extreme outside of the fume washer.

Pickling plant for pickling of metal parts has been made in accordance with similar principles, and Figs. 3 and 4 illustrate such pickling plant which basically consists of a p.v.c. bath made with reinforced sections into which are submerged the p.v.c. pickling baskets. Perforated sheets at the back permit the transfer of the fumes into the rear section of the cupboard with

* Rediweld Ltd.

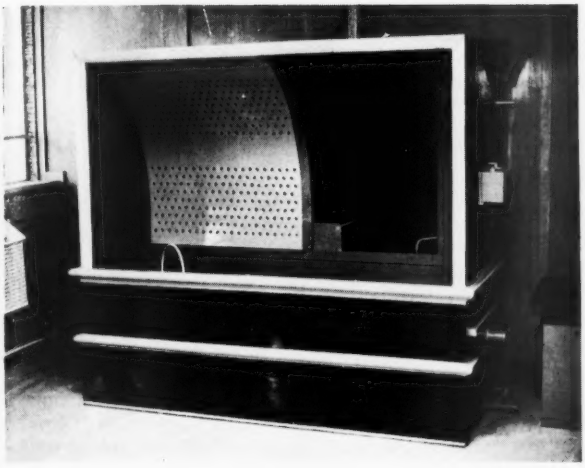


Fig. 3. View of pickling plant fabricated in p.v.c. throughout.

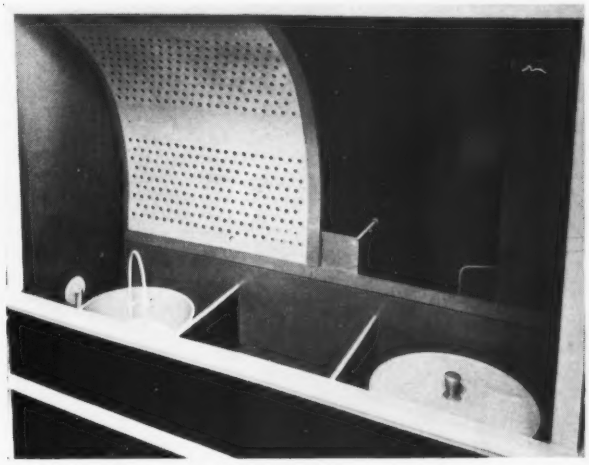


Fig. 4. Close-up view of interior of pickling plant showing use of welded structures.

a down-draught feeding them through two ducts, the suction in which can be controlled individually by means of dampers. The final removal of fumes takes place in the vertical upwards section shown on the right-hand side.

Spraying is carried out again by means of a water spray, but in this case neutralizing is also effected through a drip feed of ammonia. The ammonia container, with its needle valve control

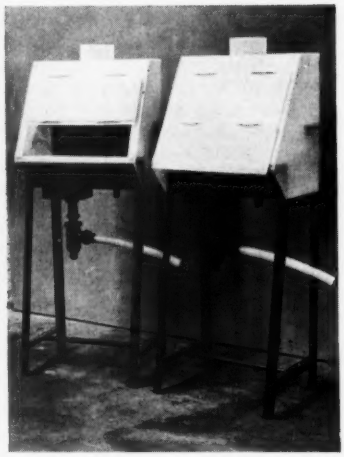


Fig. 5. Etching benches with steel bases carrying a polythene lining, to obviate attack by hydro-fluoric acid etching fluid.

and filling plug, is visible on the right-hand face of the plant. Such pickling plants are made in various sizes with 2, 3 or 4 individual compartments.

The etching benches shown in Fig. 5 are of a somewhat different construction. In this instance steel bases have been provided and carry a polythene lining. Since etching with hydro-fluoric acid is required, polythene is preferred in this instance.

A small well is provided at the base of the sink, which is also lined with polythene and connected by means of a moulded polythene sink trap to the drain. Fume extraction takes place at the top through a 6-in. bore polythene tube, and the front cover is made in two sections which are hinged and can be folded back so that it is possible to work fully closed, half open or fully open. A bottle shelf, which is part and parcel of the steel construction and is lined top and bottom, is visible on the right-hand unit (the translucency of the material permits seeing the steel insert inside the cabinet).

Finally a vertical centrifugal p.v.c. pump for the pumping of plating solutions which works in conjunction with a p.v.c. filter is illustrated in Fig. 6. The pump is fitted in a vertical position with a motor located on top and feeds acid through a flexible p.v.c. pipeline to the body of the p.v.c. filter. Inside the filter body an expanded polythene basket is provided, supporting a filter bag made from p.v.c. filter cloth. A drain cock is visible at the base and circulation of the acid which is contaminated with sludge takes place from the plating tank through the filter and back to the plating tank. The sludge is retained in the p.v.c. filter bag.

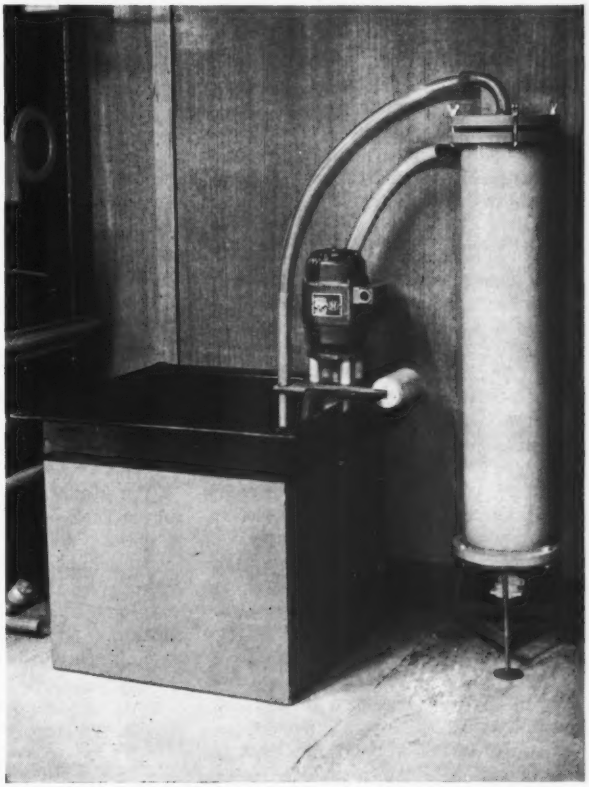


Fig. 6. Vertical centrifugal pump made in p.v.c.

Fig. 7. (left) Fluon gaskets are used in this p.v.c. ball valve. Valves of this kind are manufactured for very high duty application but also have great interest for use in the general purpose field.

Fig. 8. (right) Ziegler-type polythene has been used to manufacture these flasks to give superior maximum service temperatures.

A rather interesting design of a ball valve is shown in Fig. 7. This valve is fabricated from rigid p.v.c. and fitted with Fluon gaskets. It is of particular interest because the flow of the liquid takes place through an unrestricted cross section in the moving part of the valve.

Full closure of the valve is obtained by a 90° turn, and it is, of course, possible to set the valve for any partial flow in between the fully open and fully closed positions.

Finally, it should be mentioned that injection moulding of the harder grades of polythene (linear polythenes, high density polythenes) is now being carried out on a commercial scale.

Fig. 8 shows a number of Erlenmeyer flasks which have been injection moulded in a Ziegler type of polythene and have the advantage of standing up to considerably higher temperatures than is the case with the conventional types of polythene.

# The Plastics Industry, Institute and Press

*A review of a paper delivered by C. W. Welch, Chairman, London and District Section of the Plastics Institute, to the London Section on December 17, 1957*

THE author commenced by defining the scope of the paper, which was to outline the growth of the plastics industry, Institute, and press, showing the interrelation of each with the other, and further, the important part played by the Institute and press in the development of the industry. With this as the central theme, the author was able to link the pattern of development in Great Britain with that of other countries and by offering some critical opinions on a number of specific points, notably investment policy, research, and education, to initiate a controversial discussion.

### The Plastics Industry

Adequate records of the world's plastics industry commenced with the publication of *Kunststoffe* in 1911. Prior to that time, records were obscure, and in order to present a miniature history of the early days the author made an extensive survey of literature issued by the small number of companies engaged in plastics before 1911, and also published documents, books and periodicals held at such institutions as the Patent Office and the British Museum.

The author outlined first the growth of gutta percha, cellulose nitrate and acetate, and phenol formaldehyde condensates. He then discussed the rapid expansions of the period 1920–39, highlighting the importance of work in the high pressure field by I.C.I. to yield polythene, and the work of German and U.S. organizations on p.v.c. and polystyrene. He noted the historical dependence of this work on the investigations of chemists of the Nineteenth Century who had laid the basis of classical research in the polymer field.

Slides were shown to underline the tremendous leap forward in manufacturing potential consequent upon the last war.

The author then turned to the situation today, stressing the importance of new developments in the fabricating sector of the industry, especially the increasing investment in the industry by large companies with basic interests in other fields.

### The Plastics Institute

The Transactions of the Plastics Institute provided an invaluable record of the growth of this body. Reference was made to the personalities who were responsible for its foundation and to the nature of its work and finances in the early days.

A comparison was made, in terms of activity and membership, with other comparable bodies abroad. The educational aspect of its work was specially stressed, underlining the urgency of promoting an identity of interest in this matter between the industry, the British Plastics Federation, and the Institute.

The author also discussed the absence in the U.K. of a national teaching centre, a national testing laboratory for plastics, and a national research centre, noting the recent formation in the U.S.A. by the Society of Plastics Engineers of a Plastics Institute to provide such facilities for the American industry. The implications of this gap in our national resources was then explored, in particular the possible effects on the growth of the British industry.

### The Plastics Press

After defining the plastics press and its objectives, the author discussed the changing climate of industry, whereby the flow of technical information had been much increased. The importance of a free and independent press was underlined, and some specific instances of intervention by technical journals in matters of moment to the industry were noted. The function of technical journals as a means of welding together many diverse production units to form a homogeneous industry was discussed.

The author concluded his paper with the following comment:

"In the ultimate analysis, all three institutions, the industry, the Institute, and the press, will be found to be interdependent. If this has a faintly trite ring, I emphasize that our interdependence is not always acknowledged, or the implications thereof fulfilled. This paper, which has attempted to delineate the various inter-relationships, will have served its purpose more than adequately if it reminds us of our responsibilities, not merely in our specific fields of activity but in the overall sense. As industrialists we must cherish our Institute and see that it is in all respects a fruitful and influential Institute. As members of that Institute, we must strive to raise the status of our industry, to preserve the identity of that industry. As journalists we must ensure that opinions can be expressed freely and that the achievements of our industry and Institute are made known to the outside world."

There followed a very interesting and controversial discussion, a record of which will be published, with the full paper, in a forthcoming issue of the *Plastics Institute Transactions*.

# Patent Review

The following abstracts have been made from specifications at the Patent Office, with the permission of the controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 3s. 6d. each (including postage).

**B.P. 783,776. Stiffening materials for footwear and other articles.** R. Martens. To: Rhenoflex G.m.b.H.

Flexible materials subsequently stiffened by treatment are highly desirable but difficult to produce as they easily show brittleness after treatment, uneven hardening or sensitivity to water. A material which can be sewn, does not become brittle when stored and is stable to moisture and temperature is obtained by impregnating a fabric, felt or fleece base with water-soluble hardenable precondensates of synthetic resins (60% to 95%) and simultaneously with a non-water-soluble, non-hardenable polymer of vinyl acetate, an acrylic acid ester or a methacrylic-acid ester and/or mixed polymers of these products (5% to 40%).

**B.P. 783,779. Plastic-cum-metal beading.** C. W. Clark.

A strip of metal coated with a layer of plastic and bent lengthwise to form a U-section with the free ends close together.

**B.P. 783,785. Production of laminated sheet materials.** W. Berry, R. A. Rose, A. A. Lancaster. To: British Cellophane Ltd.

Dry solid films of water-sensitive, organic, non-fibrous materials are formed into a nip and an aqueous dispersion of a synthetic organic polymer or copolymer vinylidene chloride of a certain type is introduced into this nip. After leaving the nip the films are passed on in intimate contact. The water of the dispersion is wholly absorbed by the films and the organic polymers or copolymers coalesce to a continuous moisture-proof layer uniting the films.

**B.P. 783,790. Copolymers of ethylene and articles produced therefrom.** M. W. Bartlett, J. T. Dickson, J. F. Dight. To: British Cellophane Ltd.

A graft polythene/vinyl chloride (or acrylonitrite, vinyl acetate, methylacrylate, vinylidene chloride) copolymer.

**B.P. 783,837. Binary copolymers of vinyl-chloride and dialkyl esters maleic acid.** To: United States Rubber Co. (U.S.A.).

**B.P.783,905. Method for the making of water-soluble film-forming synthetic polymers.** To: Minnesota Mining & Mfg. Co. (U.S.A.).

**B.P. 783,906. Control knob for push-button switches and the like.** L. Hoyles. To: English Telephone Co., Ltd.

With a recess and a moulded transparent plastic (methyl methacrylate) protective plate for arranging a marking (white acetate sheet) during manufacture in the knob.

**B.P. 783,933. Production of copolymers of chlorotrifluoroethylene and vinylidene fluoride.** To: Allied Chemical & Dye Corp. (U.S.A.).

**B.P. 783,956. Manufacture of epoxy resin products.** Aero Research Ltd., J. B. D. Mackenzie.

**B.P. 783,960. Manufacture of moulded components.** W. G. Hawkins. To: C. J. Clark Ltd.

Multi-ply components such as toe-cap stiffeners, shank-backers and other footwear articles composed of leatherboard impregnated with synthetic resin are conditioned immediately prior to moulding.

**B.P. 783,988. Ink wells.** C. A. Tacey. To: Philip & Tacey Ltd.

Special shape of reservoir and cover with guide tongue.

**B.P. 784,035. Cigar and cigarette holders.** J. M. Barnett.

With filtering grains. A cup-shaped outwardly open plug with a cylindrical slotted projection reaching into the grain-filled holder acts as closure.

**B.P. 784,037. Polythene and articles made therefrom.** To: General Electric Co. (U.S.A.).

Polyethylene of viscosity average molecular weight above 16,000 is irradiated with high energy electrons within a dose range from 1 to 2.5 $\times$ $10^6$ R in order to improve the stress cracking characteristics.

**B.P. 784,044. Loop handles.** K. A. Franzen (Germany).

Made of two shell-form parts. The end of each limb of each part of the loop is provided with an outwardly-directed tongue. The tongues are interconnected by welding or soldering.

**B.P. 784,050. Insulating bags for maintaining the temperature of foodstuffs.** To: Coca-Cola G.m.b.H. (Germany).

Outer panels and inner panels with insulating material between them and a slide fastener on top.

**B.P. 784,060/61. Flexible tubing.** To: Hoover Ltd. (U.S.A.).

With varying depth of corrugation so that the depth is greater at an end portion than in the remainder of the corrugated hose.

**B.P. 784,111. Plastic joining strip.** To: Wey-Etablissement (Switzerland).

For use in building constructions. Made of polyvinyl chloride with an expansion section and a connecting web in this section and with anchoring heads and sealing sections.

**B.P. 784,141. Manufacture of synthetic resins.** W. W. Triggs. Comm. from: J. J. van den Hurk.

Refers to resins on the basis of interpolymers of alkyd resins with polymerizable compounds containing a $CH_2{=}C<$ group (styrene or the like) used in coatings, paints, enamels, varnishes.

**B.P. 784,161. Electric cables and insulated wires.** L. G. Brazier, R. M. Black. To: British Insulated Callender's Cables Ltd.

The face of the body (cable fitting) from which the conductors project is subjected to high energy irradiation, before the soldering operation, to reduce the risk of softening.

**B.P. 784,170. Insulation for electrical conductors.** To: General Electric Co. (U.S.A.).

No thermoplastic has been acceptable for use in dry locations at 90° C. and in wet locations at 60° C. It has been discovered that a specific combination of ingredients of a vinyl chloride resin and an unbalanced plasticizer (pentacrythritol dibutyrate dicaprylate containing from 0.1% to 0.5% hydroxyl) solves the problem.

**B.P. 784,190. Process for the production of artificial leather of deerskin-like character.** To: Deutsche Gold- und Silber-Scheideanstalt (Germany).

A substrate (fabric) is coated with a flexible, gelled polyvinyl chloride coating. To the coated side is applied a thin layer of coloured polyvinyl chloride paste including a plasticizer. Onto this layer is sprayed a gasifiable powder (ammonium carbonate or bicarbonate) and the material heated to gel the chloride paste.

**B.P. 784,222. Self-retaining bushes.** Tyer & Co., Ltd., C. G. Roberts.

Made of resilient transparent plastic material with rounded end flanges and longitudinal slots from one end so as to yield when inserted in a hole and snap back around the end of the hole.

**B.P. 784,235. Production of artificial sausage casings.** B. V. Fox. To: British Cellophane Ltd.

Casings produced by known methods have shown the serious defect that the inner walls assume a ribbed appearance with weakened portions leading to splits during filling. This seems to be the result of excessively rapid setting of the tubular structure. By making the coagulating bath from an aqueous solution of a water-soluble calcium salt in the range of 0.1% to 4.9% (weight) the setting could be controlled.

**B.P. 784,254. Carbon-filled polyamides.** To: E. I. Du Pont de Nemours & Co. (U.S.A.).

Carbon is added as a dispersion of colloidal particles in water to a boiling mass of polycarbonamide-forming reactant and water is then evaporated at a certain rate.

**B.P. 784,264. Batting materials.** To: Celanese Corp. of America (U.S.A.).

Staple fibres are formed into a coherent product in which the degree of bonding decreases from each surface towards the interior by applying a solvent first to one surface, and suction to the other surface to draw solvent vapour through the body of the batting, and then reverse the arrangement (solvent to the second, suction to the first surface) while the batting is uncompressed.

**B.P. 784,274. Radiation-induced polymerization.** W. G. Barb, Dr. V. E. Yarsley (Research Laboratories) Ltd.

Refers to the polymerization of olefinic monomers under the influence of radiation from radioactive isotopes ($\alpha$-particles, $\beta$-particles, neutrons, X-rays) so that the polymer separates as a particulate solid phase followed by removal as soon as it is formed (by centrifugation).

**B.P. 784,283. Process for the preparation of polyvinyl chloride.** To: N.V. De Bataafsche Petroleum Maatschappij (Netherlands).

**B.P. 784,289. Machines for cutting tubes of pasteboard or similar or plastic material.** To: Lilla Edets Pappersbruks A.B. (Sweden).

A number of knives are arranged in a circle around the tube mounted on a core. The knives have a concave cutting edge corresponding to the outer diameter of the core, and are radially moved towards the tube by compressed air and through the tube against the hardened core. The cuts are said to be clean and the knives wear resistant.

**B.P. 784,318. Textile materials.** H. Ewing, A. H. Gentle. To: British Celanese Ltd.

Production of flexible sheet material having a valuable degree of fire resistance and which may also be made waterproof and with a high strength-weight ratio by applying a coating coalesced by hot pressing of a gelled polyvinyl

chloride plasticized with tricresyl phosphate. For driving belts, tapes, also for decorative purposes, lampshades.

**B.P. 784,326. Brushes and polishing pads.** W. E. K. Waiting.

With a recess for a collapsible tube.

**B.P. 784,333. Artificial flowers.** H. W. Stroud.

Petals (e.g. of polythene) each with an internally projecting tongue around a plug with head and retaining ring on a stem. The retaining ring is disposed within the artificial bloom.

**B.P. 784,345. Quilt-like bed covers and chair cushions.** A. Richter.

Comprising a sandwich of sheets of expanded plastics with a layer of filling between the sheets.

**B.P. 784,374. Joints between metallic parts.** To: Chemische Werke Huls A.G. (Germany).

The metallic building elements are, in addition to screw bolts, held together by a polymerized unsaturated polyester resin.

**B.P. 784,381. Coat Hangers.** M. A. Gild (South Africa).

Moulded with an elongated recess under the hook along the hanger to facilitate insertion in a garment.

**B.P. 784,398. Polyisocyanate alkyd resin compositions.** E. Simon, F. W. Thomas. To: Lockheed Aircraft Corp.

Simplified foaming reactant compositions for producing cellular plastics of low density, small cell size and excellent physical strength characteristics.

**B.P. 784,443. Shirring apparatus.** To: Union Carbide & Carbon Corp. (U.S.A.).

For shirring flexible tubing of regenerated cellulose to produce sausage casing (for skinless frankfurters and wieners).

**B.P. 784,487. Compositions suitable as coverings for floors or walls.** F. L. Brady. To: Marley Floor Tile Co., Ltd.

The binder to be used with a filler (fibrous matter and pigment) is composed of a copolymer of vinyl chloride and vinylidene chloride or styrene.

**B.P. 784,488. Laminated sheet material suitable for floor coverings and the like.** F. L. Brady. To: Marley Floor Tile Co., Ltd.

A base layer of felt or a woven material saturated with coal tar, a wear resistant surface layer made from a thermoplastic elastomeric composition, and an intermediate uniting layer.

**B.P. 784,502. Process for producing shaped bodies.** To: Farbenfabriken Bayer A.G. (Germany).

Porous construction elements liable to attack by pests and fungi are bonded by a solution or dispersion of an organic adhesive in water in which is dispersed a water insoluble pesticide and also a de-emulsifying agent sufficient to break the dispersion of pesticide. The adhesive may be a natural glue or a synthetic condensation resin.

**B.P. 784,503. Process for producing an article or surface with a protective covering of thermoplastic material.** L. J. Moncrieff. To: British Celanese Ltd.

For affixing objects to a backing for display (in shops or museums). A thin thermoplastic sheet in a highly softened condition is suddenly drawn in close overall contact with a surface by rapid suction. The cooled thermoplastic then adheres to the articles as a membraneous protective covering.

**B.P. 784,511. Glass fibre reinforced sheet or mat.** W. H. W. Schuller.

Reinforcement at the edges only by slivers of glass fibre disposed in the surfaces of sheet or mat.

**B.P. 784,519. Artificial catgut.** A. S. Bell. To: British Celanese Ltd.

With a content of high tenacity regenerated cellulose continuous filament, which may be surrounded by fibres of a linear polyamide, covered with a flexible waterproof protective coating (on a basis of a linear polymer or copolymer of a polyvinyl derivative).

**B.P. 784,528. Flexible containers.** P. J. Schofield. To: I.C.I. Ltd.

It is customary to secure flexible liquid containers to a supporting structure by rubber buttons. The system has little adaptability and the buttons are difficult to fix to polythene or polythene coated containers. Pockets are now secured to the container into which the buttons are pushed with their base, which may be reinforced by a disc, e.g. of unplasticized polyvinyl chloride.

**B.P. 784,611. Curing of polymerizable materials.** G. L. Foster, P. F. Nicks. To: I.C.I. Ltd.

Refers to the curing of methacrylate and acrylate ester (for laminated products) in the presence of a hydroperoxide curing catalyst, a "drier" and an ester derived from an allyloxyalkanol.

**B.P. 784,624. Radio-active polymerization of styrene with unsaturated esters.** To: Esso Research & Engineering Co. (U.S.A.).

**B.P. 784,627. Device for casting films.** To: J. P. Bemberg A.G. (Germany).

A casting element which does not dip into the liquid in the coagulation bath, has a casting slot with an electric heating element (chrome nickel wires) arranged along each side.

**B.P. 784,640. Production of artificial sausage casings.** B. V. Fox, R. G. Hardiman. To: British Cellophane Ltd.

A purified calcium alginate casing is subjected in the gel state to a drying treatment during which its water-content is reduced to less than 25%, then rehumified until it becomes saturated with water.

**B.P. 784,645. Hydraulic press.** CKD Ceska Lipa N.P., M. Vltavsky.

For resistance welding and for moulding synthetic plastic materials. The press is characterized by a gas-loaded hydraulic accumulator in communication with the working space of the press cylinder through a spring-loaded valve. This valve opens at a certain pressure so as to supply additional pressure when required.

**B.P. 784,657. Machine for applying liquids to travelling webs of material.** To: Jagenberg-Werke A.G. (Germany). (Add. to: 743,768.)

**B.P. 784,671. Fibrous products comprising fibres bonded with dextran xanthate.** L. J. Novak. To: Commonwealth Eng. Co. of Ohio.

Refers in particular to non-woven products.

**B.P. 784,692. Process and machine for the continuous production of sections from synthetic resins.** R. Imbert P. de Vinzelles (Morocco).

A series of trains of high frequency electric waves spaced apart by time intervals longer than the duration of one train are passed through the thermosetting material (polyester or epoxide resin) between two conductors in direct contact therewith or separated therefrom by a film of a mould release agent. It has been found that with alternating periods of passage of high frequency current and periods of rest the period for obtaining a hard product is greatly reduced (to the order of one second or a few seconds).

**B.P. 784,703. Manufacture of gloves from rubber or flexible thermoplastic materials.** F. L. Davies. To: London Rubber Co., Ltd.

A former is prepared on another former simulating the true shape of a hand. The first former is turned inside out and a glove formed on it by dipping in the known manner. The glove so formed is then also turned inside out after gelation.

**B.P. 784,732. Continuous production of corrugated reinforced plastic material.** To: Montecatini Soc. Gen. per L'Industria Mineraria e Chimica (Italy).

The production of corrugated laminates (glass mats held together by chemical bonding material) is described in the main Patent (No. 748,368). Faulty laminating of certain types of mats can be eliminated by cold corrugation of the impregnated mat with subsequent curing in moderate heat or at room temperature in air. (Add. to: No. 748,368.)

**B.P. 784,784. Hair curlers.** G. Dinger, A. E. Langley.

**B.P. 784,826. Organopolysiloxane resin foams.** To: Midland Silicones Ltd. (U.S.A.).

Preparing siloxane foams at room temperature and a method of insulating equipment with heat stable foams.

**B.P. 784,871. Production of artificial sausage casings.** B. V. Fox, G. D. Pearce. To: British Cellophane Ltd.

Refers in particular to the preparation of the coagulating bath.

**B.P. 784,877. Ornamental beads.** Chelton (Poppits) Ltd., W. T. Sanderson.

The beads are formed of resilient plastic material (moulded from polythene) and have at least one lug to be pierced by a needle carrying the cord. No knotting is necessary.

**B.P. 784,910. Curtain suspension device.** W. E. Cooper. To: C.C. Components Ltd.

With nylon (or other plastic) roller outer parts and with balls to make the device more silent.

**B.P. 784,917. Hollow stopper for bottles and the like.** H. Brune.

Made of polyethylene with a cylindrical guide portion and a sealing ring portion.

**B.P. 784,918. Packing containers of thermoplastic sheet material and method for the manufacture of such packing containers.** P. V. Klinge (Denmark).

Recesses and associated projections on body and lid parts function as a kind of press fastener so that these parts may be disassembled and assembled as often as desired.

**B.P. 784,920. Synthetic plastics.** To: Dynamit A.G. (Germany).

A process in which olefin polymerization or copolymerization products having a molecular weight of over 40,000 are extruded under pressure above flow temperature and are then given a more than six-fold stretch, whereby the macromolecules are fixed in their final parallel state. For filaments and films.

**B.P. 784,923. Properties of shaped articles of film-forming polyethylene.** To: Badische Analin- & Soda-Fabrik A.G. (Germany).

Energy-rich rays are allowed to act on the shaped article in the presence of a certain quantity of a gas reacting with polyethylene and cross-linking the article throughout its entire thickness.

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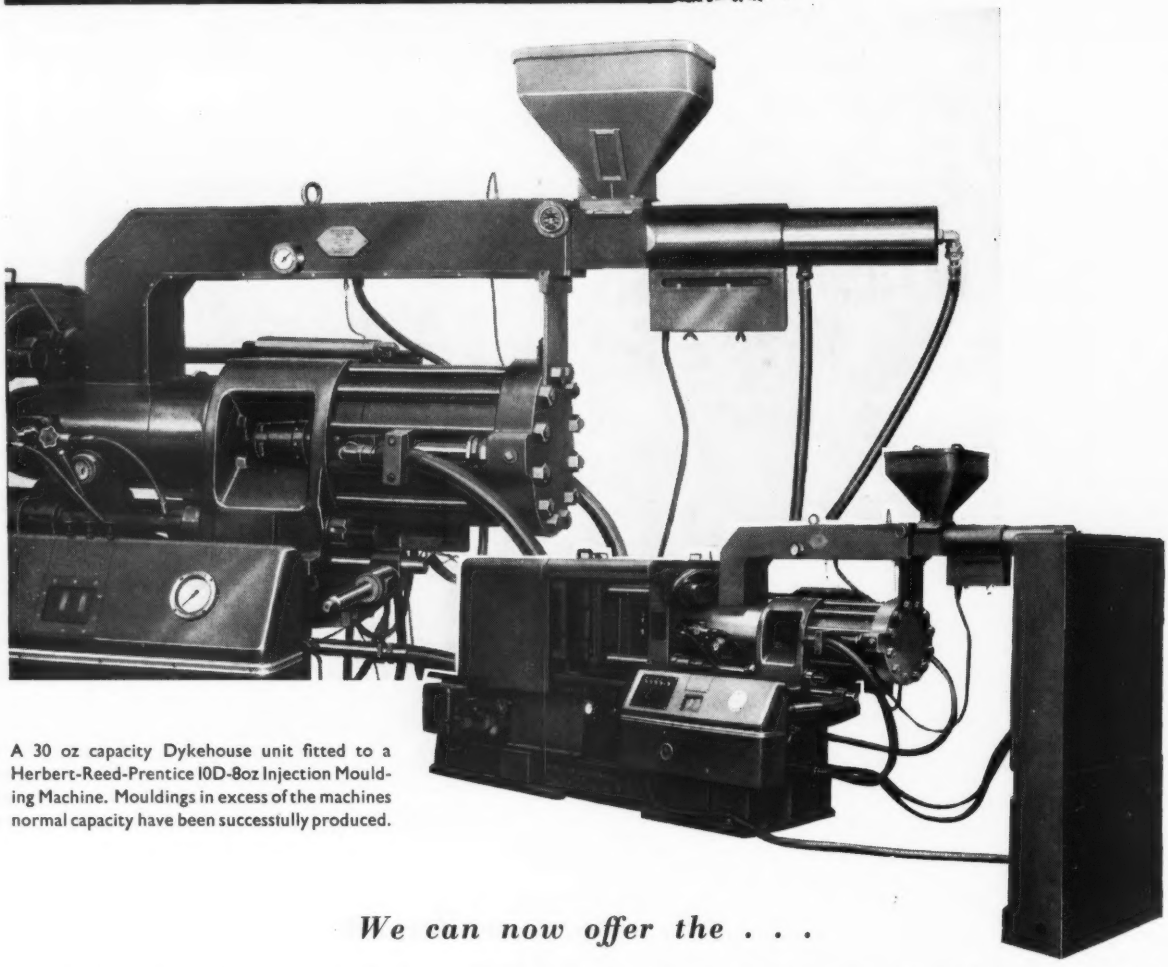

A 30 oz capacity Dykehouse unit fitted to a Herbert-Reed-Prentice 10D-8oz Injection Moulding Machine. Mouldings in excess of the machines normal capacity have been successfully produced.

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AD. 393

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This adoption of the Dykehouse pre-plasticising units by the world's leading supplier of injection-moulding machinery, after exhaustive tests, is a striking endorsement of the quality and performance of the units. That they have now become available as original equipment on the Reed 10-D-8 the tried and trusty work-horse of the world's plastics industry, is an event of the utmost significance to moulders.

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*For further information and an illustrated leaflet with full specifications of Dykehouse SUPER-THERM pre-plasticising units, write either to Cooke & Dykehouse or to Alfred Herbert. To arrange a demonstration, please communicate with Alfred Herbert Limited, Red Lane Works, Coventry.*

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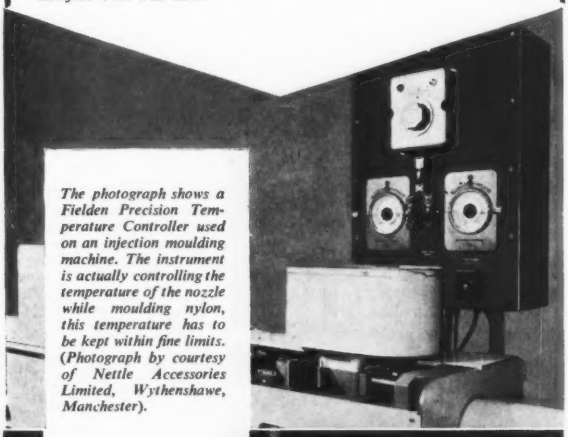
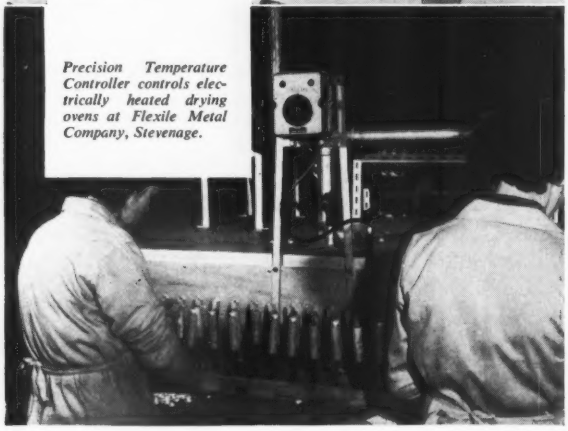


*The photograph shows a Fielden Precision Temperature Controller used on an injection moulding machine. The instrument is actually controlling the temperature of the nozzle while moulding nylon, this temperature has to be kept within fine limits. (Photograph by courtesy of Nettle Accessories Limited, Wythenshawe, Manchester).*



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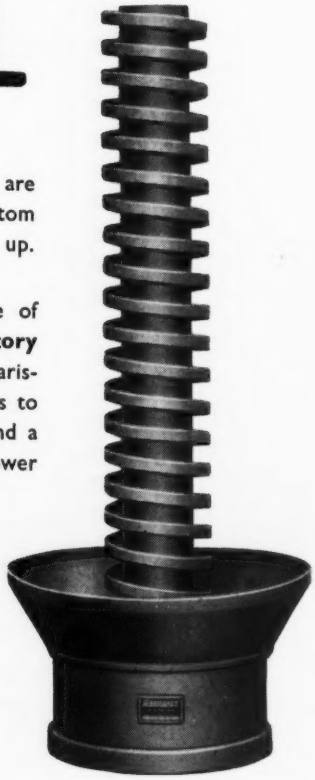

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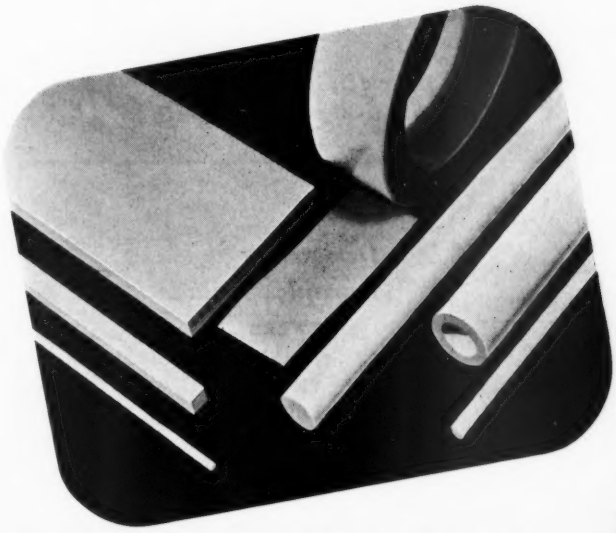

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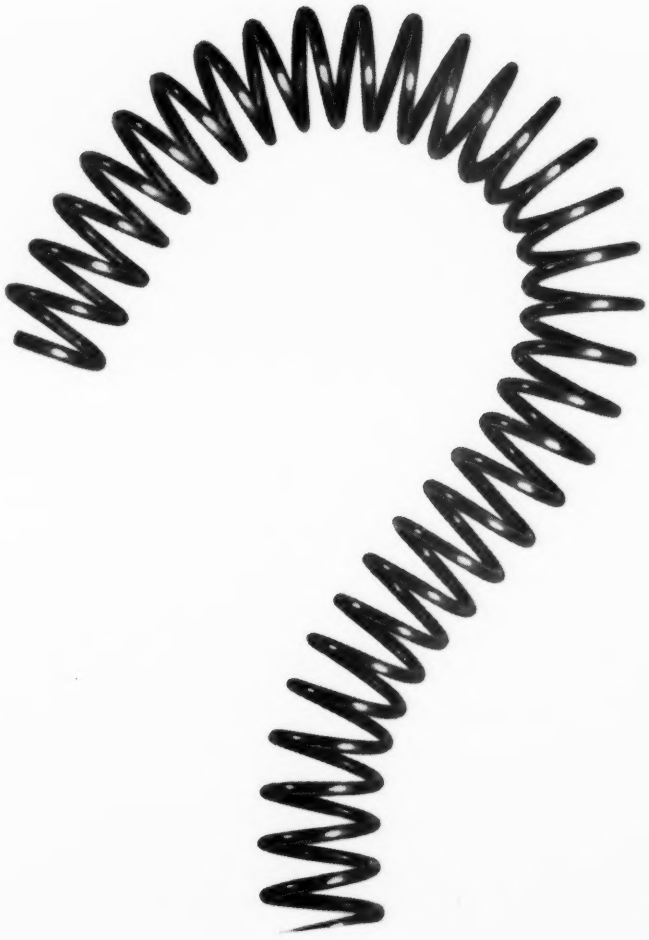

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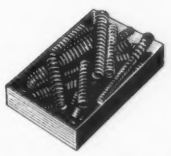

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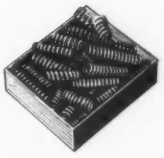

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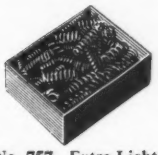

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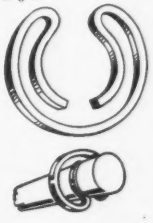

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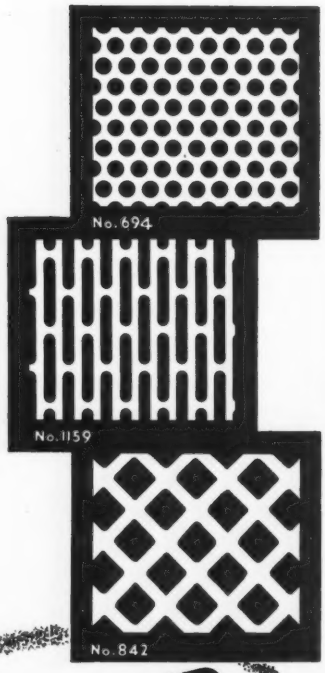


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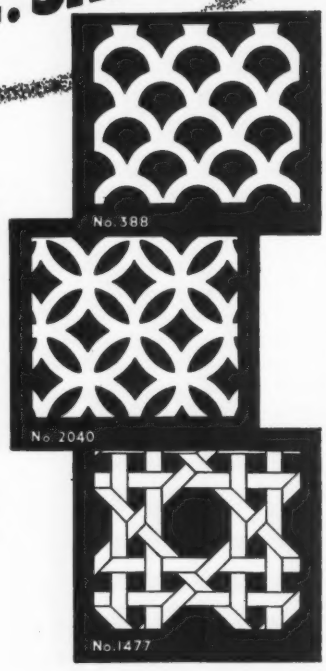


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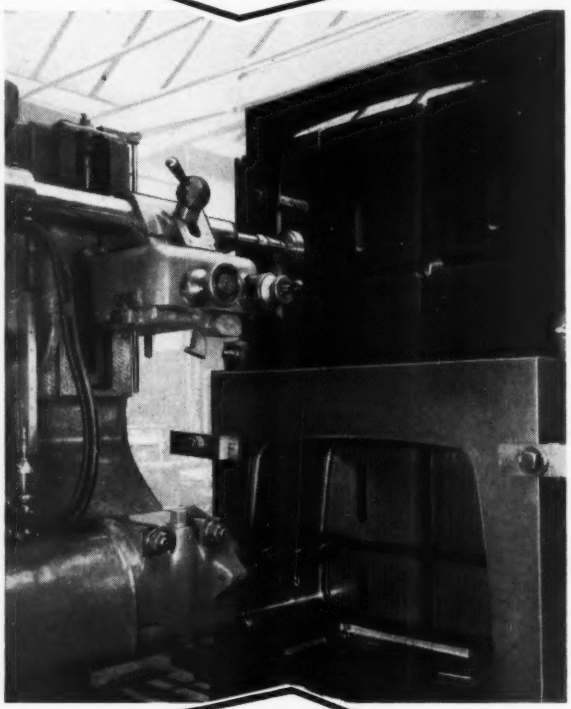

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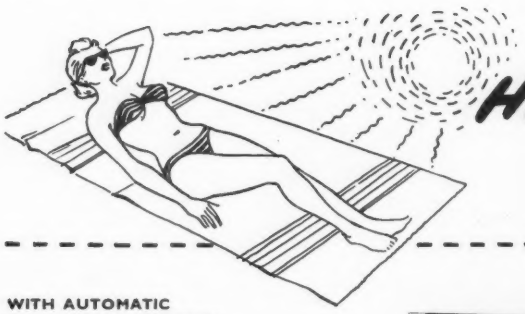

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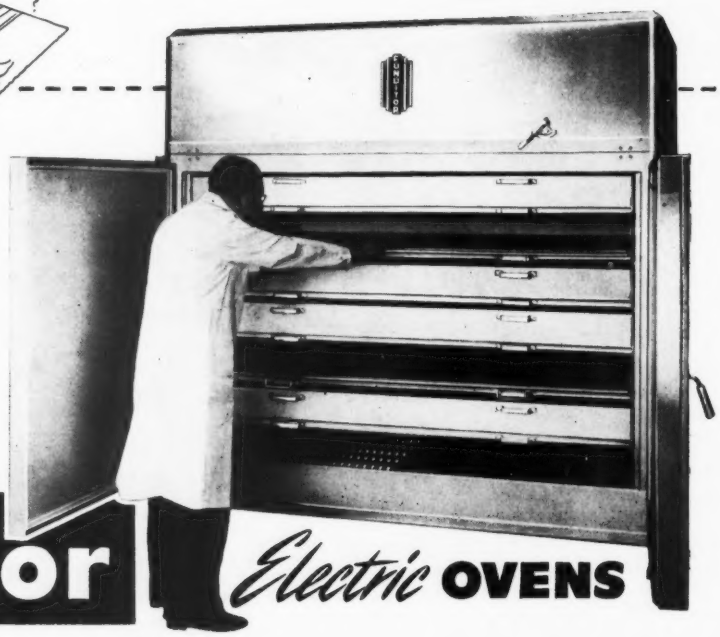

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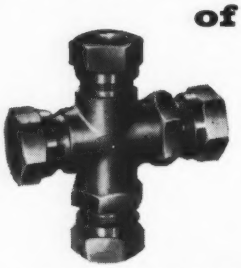

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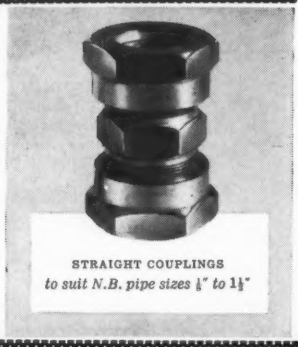

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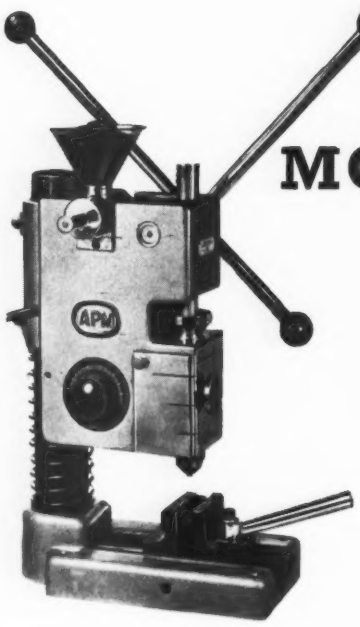


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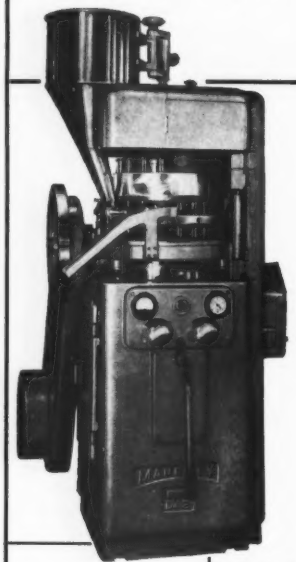

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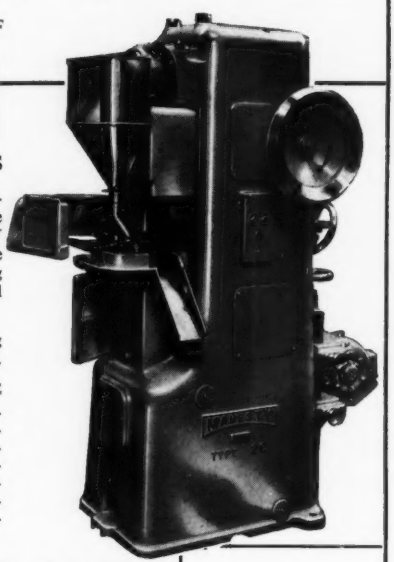

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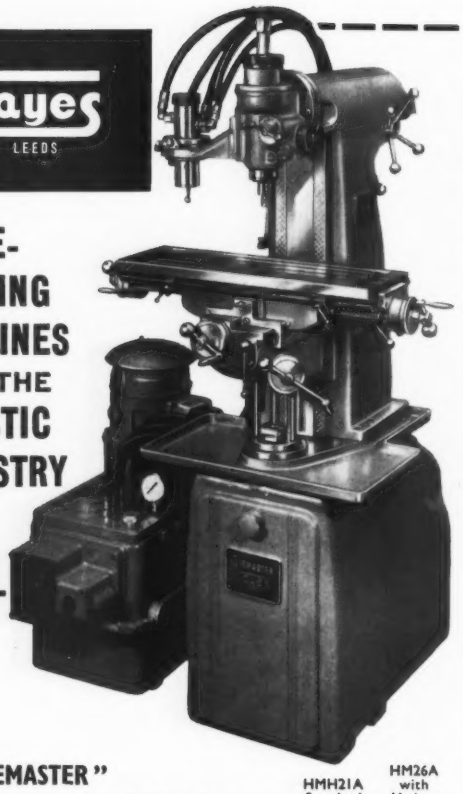

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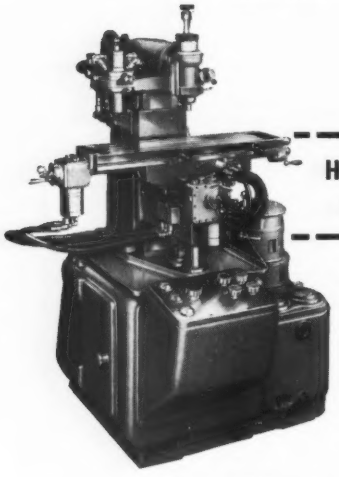

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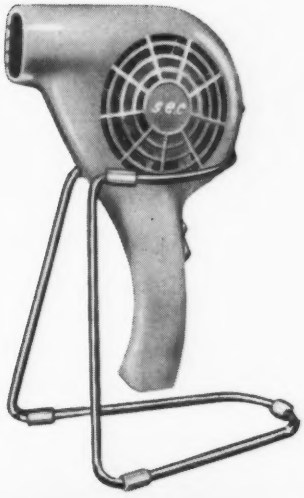

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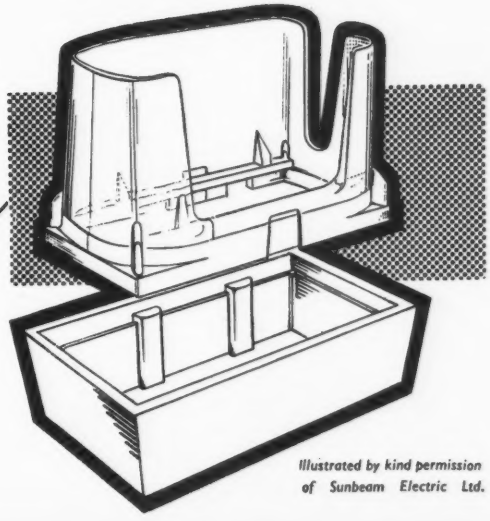

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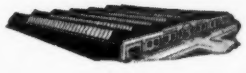

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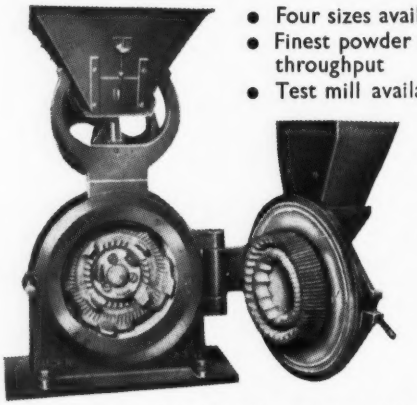

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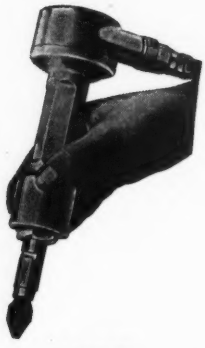

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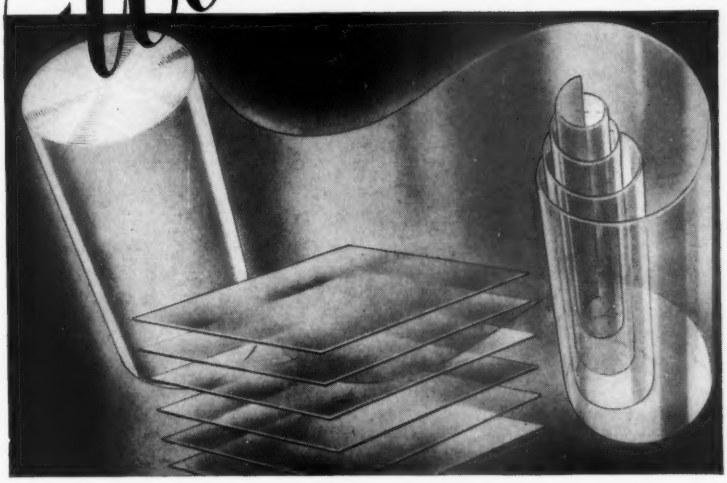

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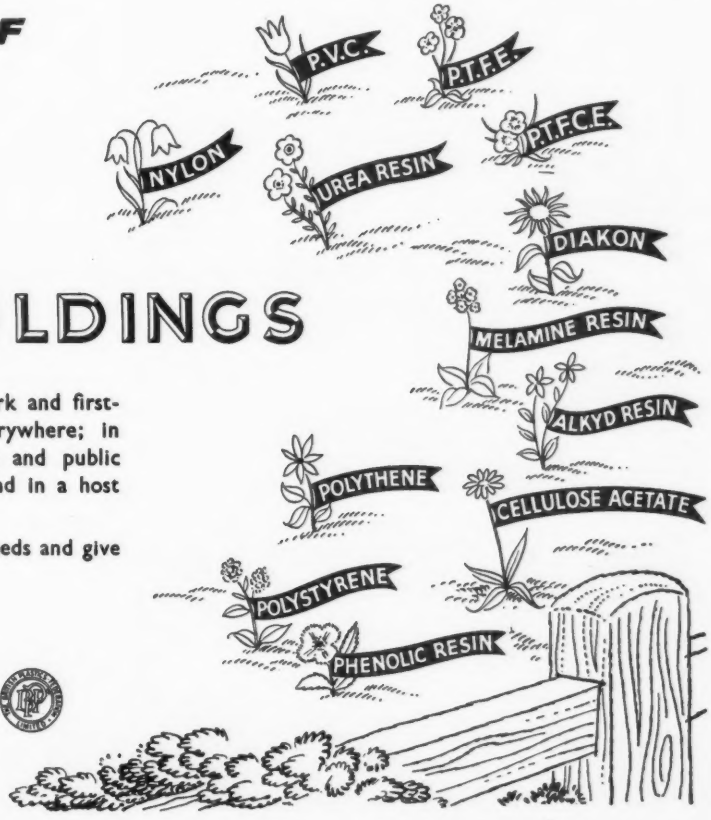


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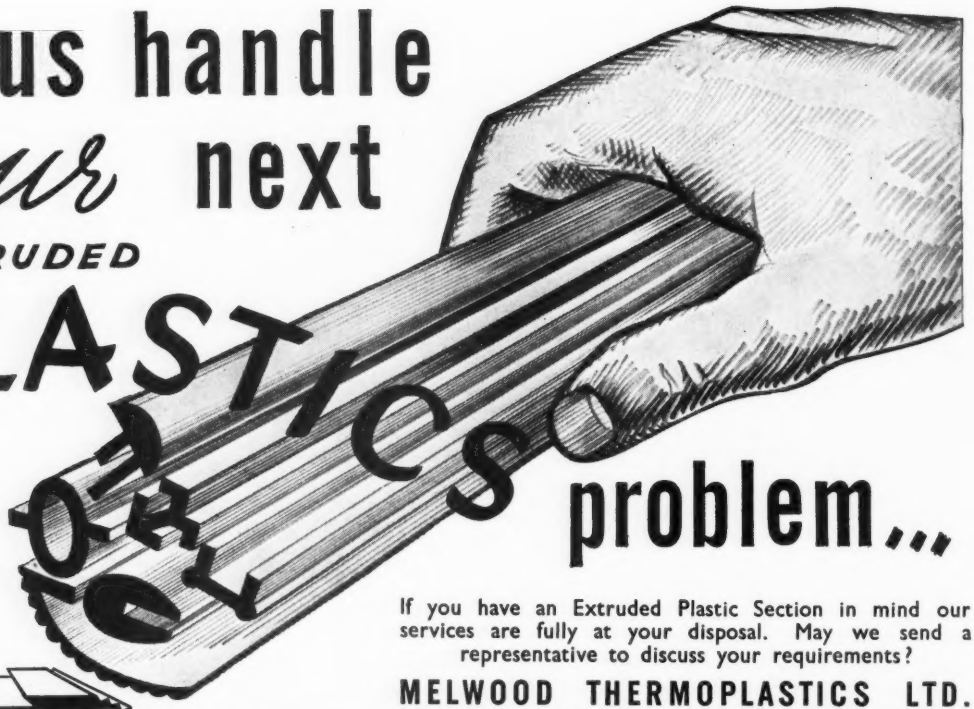

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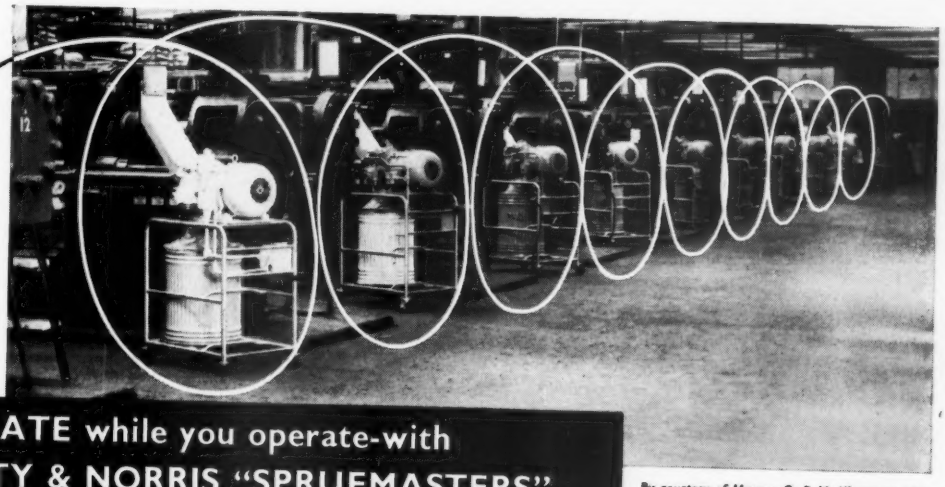

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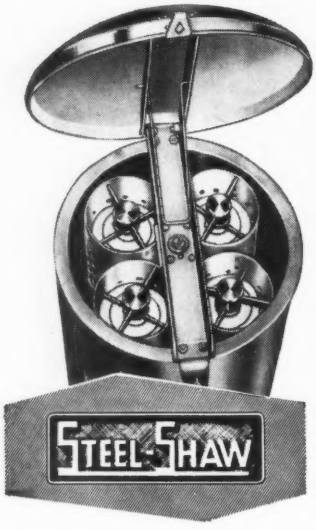


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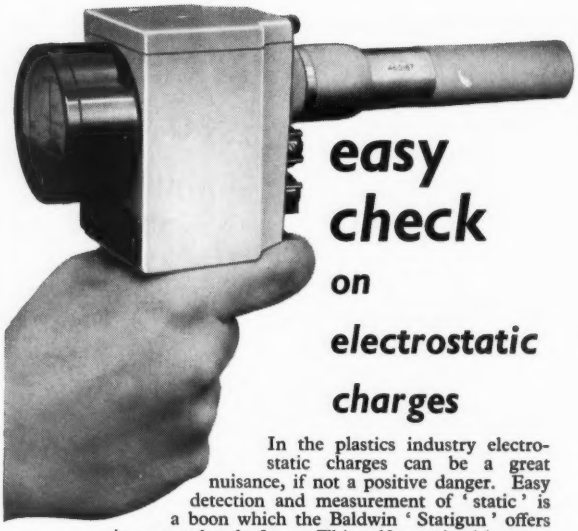

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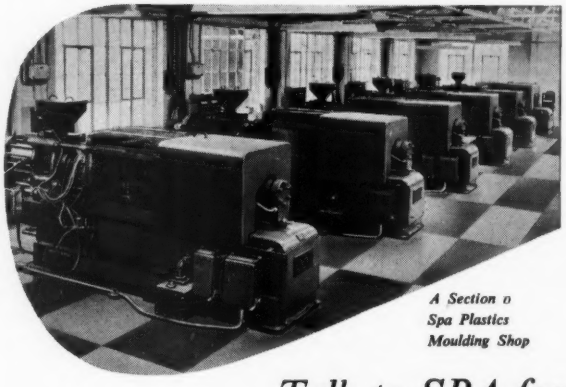

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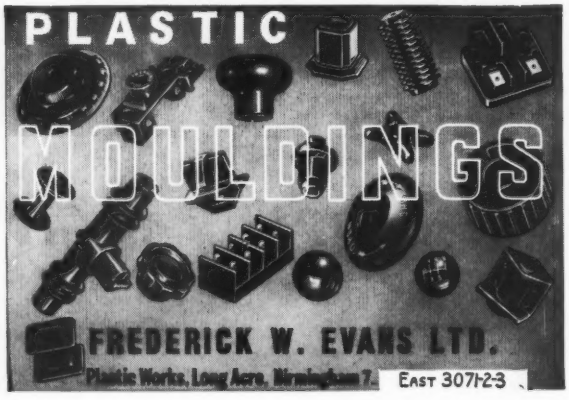
TELEPHONE : CENTRAL 2120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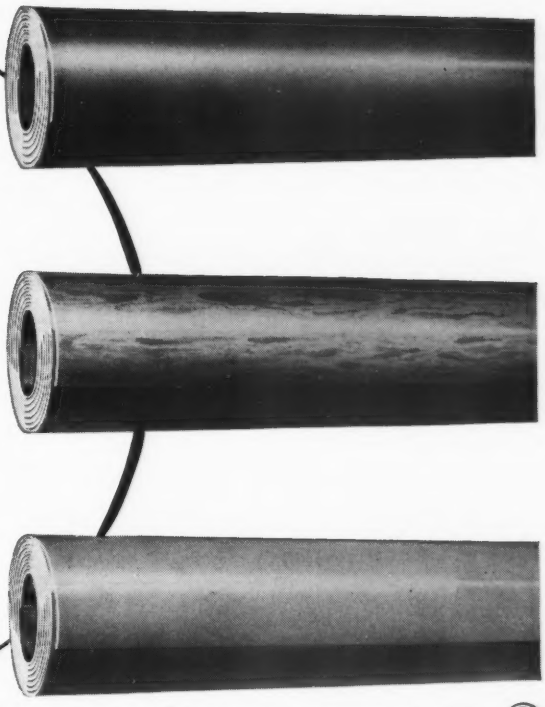

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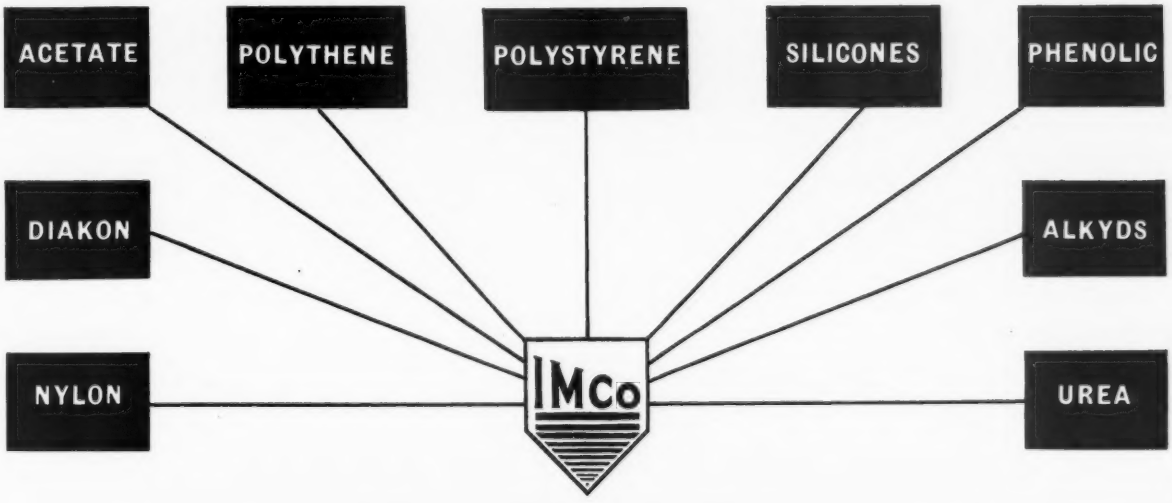


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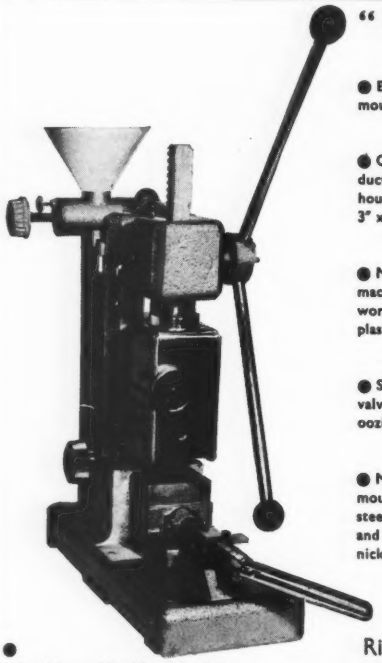

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*Manufactured by*

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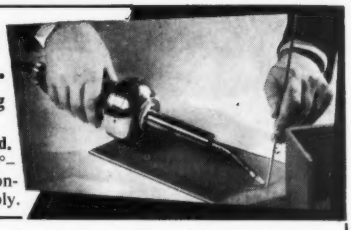

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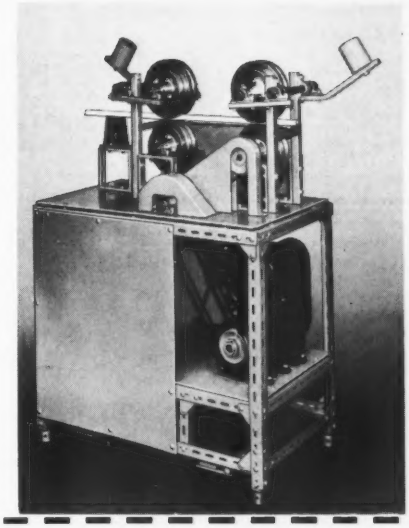

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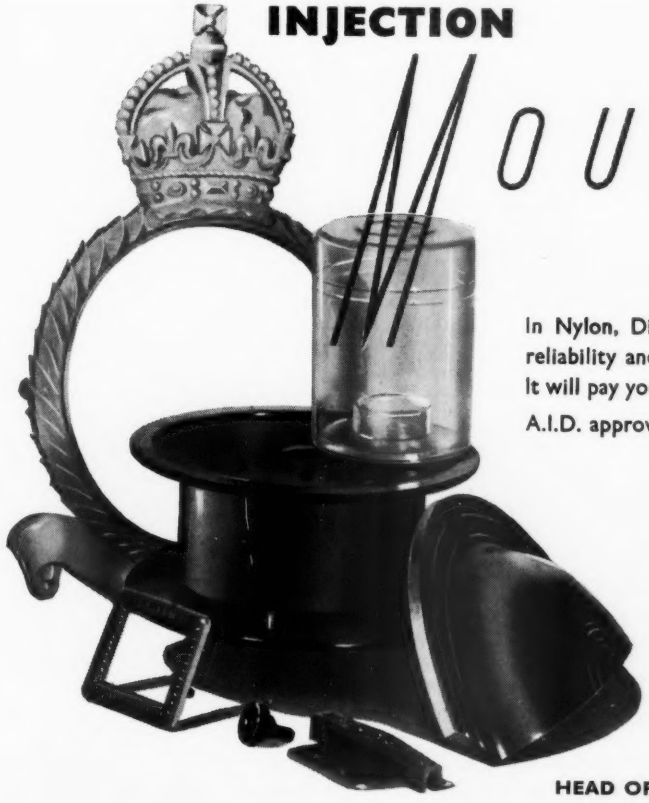

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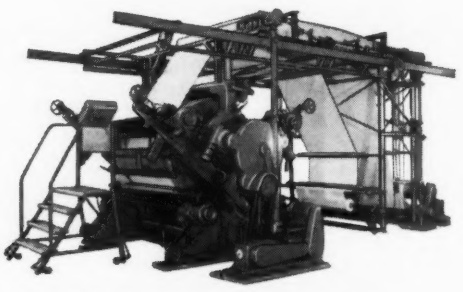

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**RATES.**—6d. per word (minimum 12 words 6/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting 2 gns. per single column inch. Series discounts of 5% for 6, and 10% for 12 consecutive insertions allowed to trade advertisers.

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**BOX NUMBERS.**—Private advertisers desiring to have replies sent care of "Plastics" may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. Box numbers must not be used for the purpose of circularizing and the proprietors do not undertake the distribution of such matter received. To avoid mistakes in forwarding, Box numbers should be carefully and legibly copied and replies sent to Box P000, care of "Plastics," Bowling Green Lane, London, E.C.1.

**DEPOSIT SYSTEM.**—Facilities are available to readers to purchase advertised goods on approval by depositing the purchase price with "Plastics." Full details on application. Commission 1% (minimum 2/-) on amount deposited.

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**BRANCH OFFICES:** Bayliss House, Hurst Street, Birmingham, 5. Telephone: Midland 6616. 50, Hertford Street, Coventry. Telephone: Coventry 62464. 1, Brazennose Street, Manchester. Telephone: Deansgate 6114-8. 12, Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

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245-29

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Hydraulic Presses of all sizes. Injection Machines. Extruders. Mixing Mills. Hydraulic Pumps and Accumulators.
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REPLANT WORKS,
WOOLWICH INDUSTRIAL ESTATE, S.E.18.
Phone: Woolwich 7611. 245-40

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### Machinery, Tools and Plant (contd.)

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245-25

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**Machinery, Tools and Plant (contd.)**

**WADKIN RADIAL ARM DRILL** for sale. Model 10A, motorised for 380/440/50, chuck capacity ¾ in., speed of motor 2,700 r.p.m., maximum working radius 5 ft. 6 in., minimum working radius 14½ in., maximum size sheet—work any length by 4ft. . F. J. Edwards Ltd., 358 Euston Rd., London, N.W.1 245-44

## MACHINERY, TOOLS AND PLANT WANTED

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**INJECTION MOULDING MACHINES** required. Condition or size not important. Send details Box P4210, care of "Plastics." 247-1027

**WANTED SECOND-HAND "WESTMINSTER" SEMI-AUTOMATIC INJECTION MOULDING MACHINES.** Box P456, care of "Plastics." 245-14

**REQUIRED TWO SECOND-HAND "ASMIDAR" INJECTION MOULDING MACHINES.** Box P455, care of "Plastics." 245-13

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**WANTED** quotation for supply handles for plastic buckets, 2-gallon capacity. Box M.453, Curran Ltd., Clonmel, Ireland. 245-x4222

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zzz-146

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**MOULDS WANTED.** Brazilian injection moulder needs moulds of all kinds for 3-oz. machines.—Box P459, care of "Plastics." 245-10

## PATENTS

**THE PROPRIETOR** of British Patent No. 705971 for "Process for making hollow bodies from fusible plastic materials" is desirous of entering into negotiations with firms in this country for the purpose of exploiting the above invention either by sale of the patent rights or by granting of licences to manufacture on a royalty basis. Enquiries should be addressed to Abel & Imray, Quality House, Quality Court, Chancery Lane, London, W.C.2. 245-24

## PRODUCTION CAPACITY AVAILABLE

**REPETITION** in Ebonite, Erinoid, etc. Capstan lathe work. Temple St., Rugby. Phone 4059. 247-5388

**INJECTION MOULDINGS** by I.O.G. Industries, Ltd., 41 Marshgate Lane, Stratford, E.15. Maryland 2804. 256-1120

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**POLYTHENE SCRAP:** top prices paid on any terms for any form of polythene scrap, i.e. extrusion lumps, scrap articles, film offcuts, ground and re-ground forms. Please send details and samples to: Herbert Connor Ltd., 120 Beaufort Park, London, N.W.11. 245-2

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**AN EXPANDING BUSINESS** requires a young man with a good knowledge of materials and processes to supervise thermoplastic moulding and extrusion. Must be able to advise on design and production methods for above processes.
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**Situations Vacant (contd.)**

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245-16

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Please apply with full particulars to:
THE STAFF MANAGER.

245-19

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**Situations Vacant (contd.)**

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